

**COMSPHERE
3500 SERIES
DATA SERVICE UNITS
MODELS 3510 AND 3511**

USER'S GUIDE

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January 1998

COMSPHERE 3500 Series Data Service Units Models 3510 and 3511

User's Guide
3510-A2-GN32-50

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Changes and enhancements to the product and to the information herein will be documented and issued as a new release.

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Bell Canada — Meets Bell Canada Metallic Specs

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Important Safety Instructions

1. Read and follow all warning notices and instructions marked on the product or included in the manual.
2. This product is intended to be used with a three-wire grounding type plug – a plug which has a grounding pin. This is a safety feature. Equipment grounding is vital to ensure safe operation. Do not defeat the purpose of the grounding type plug by modifying the plug or using an adaptor.

Prior to installation, use an outlet tester or a voltmeter to check the ac receptacle for the presence of earth ground. If the receptacle is not properly grounded, the installation must not continue until a qualified electrician has corrected the problem.

If a three-wire grounding type power source is not available, consult a qualified electrician to determine another method of grounding the equipment.

3. Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation of the product and to protect it from overheating, these slots and openings must not be blocked or covered.
4. Do not allow anything to rest on the power cord and do not locate the product where persons will walk on the power cord.
5. Do not attempt to service this product yourself, as opening or removing covers may expose you to dangerous high voltage points or other risks. Refer all servicing to qualified service personnel.
6. General purpose cables are provided with this product. Special cables, which may be required by the regulatory inspection authority for the installation site, are the responsibility of the customer.
7. When installed in the final configuration, the product must comply with the applicable Safety Standards and regulatory requirements of the country in which it is installed. If necessary, consult with the appropriate regulatory agencies and inspection authorities to ensure compliance.
8. A rare phenomenon can create a voltage potential between the earth grounds of two or more buildings. If products installed in separate buildings are **interconnected**, the voltage potential may cause a hazardous condition. Consult a qualified electrical consultant to determine whether or not this phenomenon exists and, if necessary, implement corrective action prior to interconnecting the products.

In addition, if the equipment is to be used with telecommunications circuits, take the following precautions:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.
- Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightning.
- Do not use the telephone to report a gas leak in the vicinity of the leak.

Notices

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THIS EQUIPMENT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS A DIGITAL DEVICE, PURSUANT TO PART 15 OF THE FCC RULES. THESE LIMITS ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST HARMFUL INTERFERENCE WHEN THE EQUIPMENT IS OPERATED IN A COMMERCIAL ENVIRONMENT. THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTION MANUAL, MAY CAUSE HARMFUL INTERFERENCE TO RADIO COMMUNICATIONS. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE HARMFUL INTERFERENCE IN WHICH CASE THE USER WILL BE REQUIRED TO CORRECT THE INTERFERENCE AT HIS OWN EXPENSE.

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Government Requirements

The Federal Communications Commission (FCC) requires that instructions pertaining to connection to the telephone network be included in the installation and operation manual. Specific instructions are listed in this section.

Notice to Users of the Digital Data Service

This equipment complies with Part 68 of the FCC rules. On the bottom of the equipment is a label that contains, among other information, the FCC registration number for this equipment. If requested, please provide this information to your telephone company.

If your DSU causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice is not practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of your equipment. If so, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.

No repairs may be performed by the user. Should you experience difficulty with this equipment, refer to the *Equipment Warranty and Support* section of Chapter 1.

For Digital Data Service (DDS) installations, inform the local telephone company of the appropriate network channel interface code for the service you desire.

DDS

Interface Code	Data Rate (bps)
04DU5-24	2400
04DU5-48	4800
04DU5-96	9600
04DU5-19	19,200
04DU5-56	56,000
04DU5-64	64,000

The DDS Service Order Number is 6.0Y. The jack configurations required are RJ48S for the Model 3510 DSU and RJ48T for the Model 3511. With an RJ48T configuration, you must specify the number of data lines you require (1 through 8).

After the telephone company has installed the requested jack, you can connect the DSU with the appropriate cable (provided). An FCC-compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack that is Part 68 compliant.

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Preface

Objectives and Reader Assumptions

This manual contains information for the installation and operation of the Model 3510 (standalone) and Model 3511 (carrier-mounted) Data Service Units (DSUs).

This manual assumes that you are familiar with the functional operation of digital data equipment, DDS, DSUs and your DTE devices.

Contents Summary

Chapter 1 gives a general overview of the 3500 Series DSUs, describes each model's features, and lists their technical specifications.

Chapter 2 describes the network control interfaces offered by the 3500 Series DSUs and the network configurations they support, including compatibility with other data communications equipment.

Chapter 3 describes normal operation of the Model 3510 and Model 3511 DSUs.

Chapter 4 provides DSU installation instructions and procedures for setting the hardware straps.

Appendix A contains interface connector pin assignment information; Appendix B provides timing source charts; and Appendix C provides an equipment list.

The Glossary provides definitions of all acronyms and product-specific terms used in this guide.

Related Documents

Call your sales representative for additional product documentation.

3000-A2-GA31

*COMSPHERE 3000 Series
Carrier, Installation Manual*

Reference Documents

ANSI T1.410–1992

AT&T Technical Reference 62310 (11/87)

INC Compatibility Bulletin CB-INC-101 (10/86)

Pacific Bell Publication PUB L-780035-PB/NB (9/88)

Pacific Bell Publication PUB L-780036-PB/NB
(10/88)

EIA-232-D/V.24 (ISO 2110)

CCITT V.35 (ISO 2593)

Bell Canada DCTE Specifications (7/89)

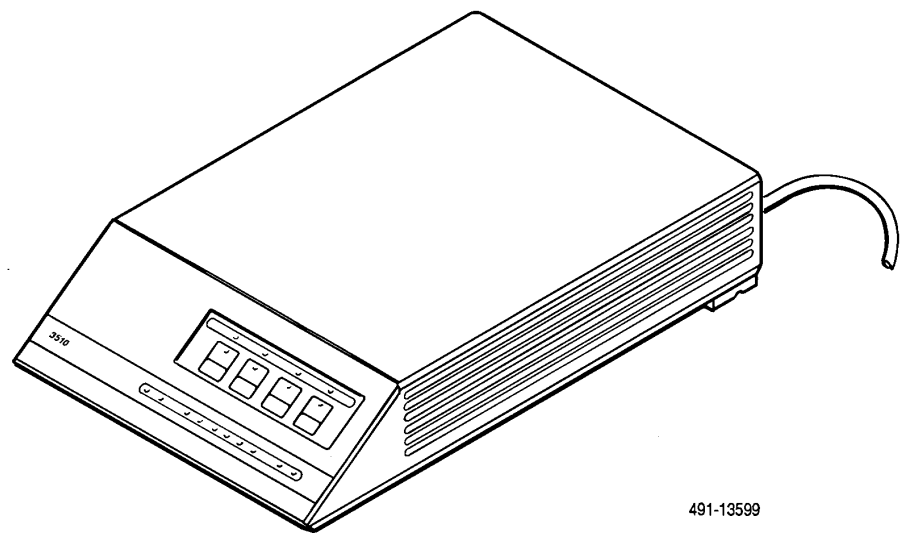
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Overview

The 3500 Series Data Service Units (DSUs) are high quality, flexible, economical devices designed for incorporation into point-to-point and multipoint digital networks operating at data rates up to 64,000 bits per second (bps). These DSUs are extremely reliable, compatible with other DSUs, and offer basic diagnostic capabilities.

Both the Model 3510 and Model 3511 DSUs (Figure 1-1) use similar circuit cards. Switches on the circuit card allow you to select various options for matching your data terminal equipment (DTE) to the digital network. By selecting the appropriate data rates, you can also use Model 3510 or Model 3511 DSUs as local area data sets (LADS).



491-13599

Figure 1-1. Model 3510 DSU

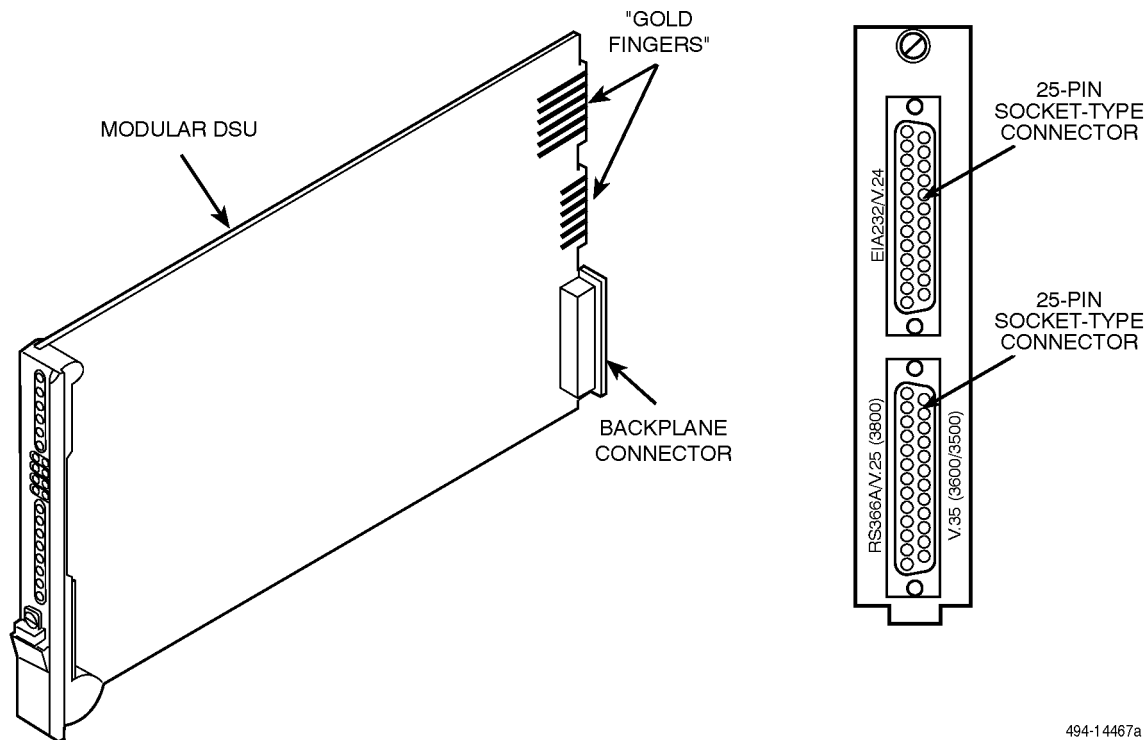
Both the Model 3510 and Model 3511 DSUs are compatible with earlier DATAPHONE II 2500 Series and 2600 Series DSUs, and they incorporate a number of enhancements. Model 3510 supersedes the 2556B, 2596B, 2656B, and 2696B DSUs. Model 3511 supersedes the 2556A and 2596A DSUs.

You can obtain compact standalone Model 3510 DSUs for desktop installation or circuit card Model 3511 DSUs for carrier-mounted installation (up to 16 units) in a COMSPHERE 3000 Series Carrier.

The Model 3511 DSU (Figure 1-2) contains “gold finger” contacts on the rear edge of its circuit card and is used with a rear connector plate. The rear connector plate contains two 25-pin (DB25) DTE connectors, a 25-pin EIA-232-D/V.24 connector and a 25-pin CCITT V.35 connector, which is shipped with a V.35 interconnect cable. If you intend to use a V.35 interface, use the cable provided to convert the DB25 V.35 interface (the bottom connector) to a standard V.35 34-pin interface.

NOTE

All of the technical information in this manual applies to both DSU models, unless otherwise noted.



494-14467a

Figure 1-2. Model 3511 DSU and Rear Connector Plate

Features

The Model 3510 and Model 3511 DSUs contain the following standard features:

- Switch-selectable data rates of 2400, 4800, 9600, 19,200, 38,400, 56,000, and 64,000 bps.
- Compatibility with the channel interface defining DDS service in AT&T Technical Reference 62310.
- Additional option switch settings, allowing 19,200 bps loop operation at levels of -10 dBm, 0, or +6 dBm in order to meet the requirements of Integrated Network Corporation compatibility bulletin CB-INC-101 and the nonadaptive Standard Service 19,200 bps loop rate specified in Pacific Bell publications PUB L-780035-PB/NB and PUB L-780036-PB/NB.
- Complies with AT&T 64K Clear Channel capabilities.
- EIA-232-D/V.24 interfacing at data rates through 19,200 bps, and CCITT V.35 interfacing at data rates through 64,000 bps.
- Synchronous data transmission capability.
- Local, digital and remote loopbacks, plus built-in test pattern generator/checker.
- Both models provide streaming terminal fault, out-of-service, and no signal indication capability.
- Elastic store for extended circuits.
- The capability to respond to digital network mandatory channel service unit (CSU) loopback, loop current reversal, and nonlatching DSU loopback requests. You can configure a Model 3510 or Model 3511 DSU for 64,000 bps clear channel operation, and it will respond to the network latching loopback code.
- Functional interchangeability as either a control or tributary DSU.
- Both DSUs can be configured to function as a point-to-point LADS at 2400, 4800, 9600, 19,200, 38,400, 56,000, and 64,000 bps.
- Compatible with earlier DATAPHONE II 2500 DSUs and 2600 tributary DSUs.

Technical Specifications

Table 1-1 lists the technical specifications for Model 3510 and Model 3511 DSUs.

**Table 1-1
(1 of 2)
Technical Specifications for Model 3510 and Model 3511 DSUs**

Technical Specifications	Criteria
APPLICATION	Serial synchronous, protocol-independent, binary data in full duplex, point-to-point, and multipoint operation
DDS DATA RATE	Operates at 2400, 4800, 9600, 19,200, 38,400, 56,000 and 64,000 bps
MODULATION	Bipolar return to zero with alternate mark inversion (AMI) encoding
LINE REQUIREMENTS DSU LADS	Digital Data Service leased 4-wire lines 4-wire private metallic lines
ENVIRONMENT Operating Temperature Relative Humidity Storage Temperature Shock and Vibration	40 degrees F (4 degrees C) to 120 degree F (49 degrees C) 5% to 95% (noncondensing) –4 degrees to 158 degrees F, –20 degrees to 70 degrees C Withstands normal shipping and handling
POWER REQUIREMENTS Model 3510 Model 3511	90 — 132 Vac, 0.07 amp at 117 Vac, 60 Hz $\pm$ 3, 5.8 watts (typical) Supplied by carrier, 6.0 watts
HEAT DISSIPATION Model 3510 Model 3511	19.5 Btu/hr (typical) 20.5 Btu/hr (typical)
MOUNTING Model 3510 3000 Series Carrier	Single desktop unit EIA Standard 19-inch cabinet, or 23-inch cabinet

Table 1-1
(2 of 2)
Technical Specifications for Model 3510 and Model 3511 DSUs

Technical Specifications	Criteria
PHYSICAL DIMENSIONS Model 3510 Height Width Depth Weight Model 3511 Height Width Depth Weight Rear Connector Plate Height Width Depth Weight	2.13 inches (5.4 cm) 7.60 inches (19.3 cm) 12.13 inches (30.8 cm) 2.60 pounds (1.2 kg) 7.13 inches (18.1 cm) 1.00 inches (2.5 cm) 13.40 inches (34 cm) 0.73 pounds (0.3 kg) 5.25 inches (13.3 cm) 0.88 inches (2.2 cm) 1.00 inches (2.5 cm) 0.19 pounds (.09 kg)
DTE INTERFACES	EIA-232-D/V.24 (ISO 2110) V.35 (ISO 2593) (Note that the Model 3511 DSU provides an electrical interface, but a rear connector plate is required for the physical interface.)
NETWORK INTERFACE	Full compliance with AT&T Technical Reference 62310, Digital Data System Channel Interface Specification, November, 1987. Compatible with the DDS DSU portions of Bell Canada Digital Circuit Terminating Equipment (DCTE) Specifications, July, 1989, Issue 1
APPROVALS FCC Part 15 FCC Part 68 UL Model 3510 Model 3511, 3000 Series Carrier CSA Safety Model 3510 Model 3511, 3000 Series Carrier Emissions Bell Canada	Class A Digital Device Reg. No. AW2USA-61422-DD-N Listed UL 1950 Recognized UL 1950 Certified CSA 22.2 No. 220—M1986 Certified CSA 22.2 No. 950—M89 CSA 108.8 Class A “DCTE Specifications,” July 1989, Issue 1

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 - International, call 727-530-2340

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Network Configurations

Connections between 3500 Series DSUs or between 3500 Series DSUs and compatible DCEs are configured in either of two ways: point-to-point or multipoint.

Point-to-Point

In a point-to-point configuration (Figure 2-1), there is one DSU at each end of the digital facility. The local DSU, and likewise the remote, may be a 3500 Series unit or one of the other devices listed in the *DSU Compatibility* section.

The primary channel characteristics of these DSUs are identical to 2500 Series and 2600 Series DATAPHONE II DSUs and Paradyne Model 3056 and 3456 DSUs; therefore, you can configure these devices for installation at either end of a network containing any compatible DSU, such as Paradyne Model 3056 units.

Multipoint

In a multipoint configuration (Figure 2-1), a control DSU is connected to multiple tributaries communicating at the same speed on a single digital facility.

For multipoint networks, the DSU at the host end of the circuit is designated as the control; the other DSUs are designated the tributaries. The control initiates remote diagnostic commands; the tributary responds to commands from the control or from its own local front panel.

A 3500 Series DSU can be used as a control or as a tributary in non-network managed networks.

Figure 2-1 depicts a basic multipoint network containing Model 3511 DSUs in a COMSPHERE 3000 Series Carrier at the local end of the network, and a combination of standalone 2500 Series DATAPHONE II DSUs and a Model 3510 DSU at the remote end.

For 2600 Series diagnostic multipoint networks, the Model 3510 DSU can also be installed as a tributary DSU. In this application, the standalone Model 3510 DSU at the tributary end is functionally equivalent to a DATAPHONE II 2600 Series DSU, and no additional support is needed.

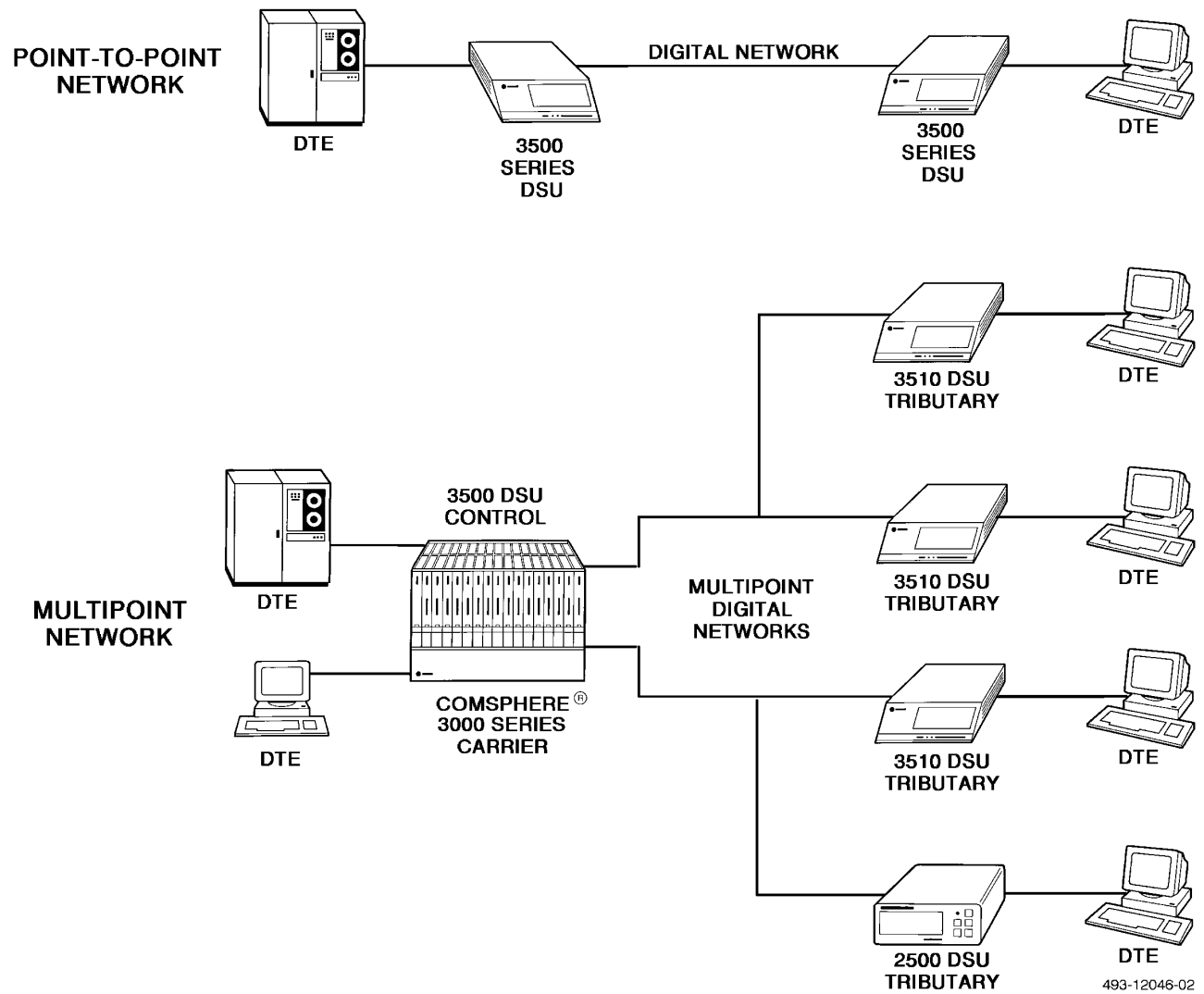


Figure 2-1. Example Point-to-Point and Multipoint Networks

DSU Compatibility

For primary channel communication, the standalone Model 3510 and the carrier-mounted Model 3511 DSUs are fully compatible with all Paradyne digital products that operate at the same speed and power level.

Point-to-point and multipoint configurations are not limited to connections between 3500 Series DSUs; many other combinations of equipment are possible.

Table 2-1 lists the diagnostic compatibilities supported by a 3500 Series DSU communicating with another device and potential operating speed mismatches.

Table 2-1
DSU Compatibilities

Paradyne Devices Communicating with 3510/3511 DSUs	Diagnostics Supported	Speeds Not Supported by the Combination of DSUs (in Kbps)
3500 Series DSU	2500 diagnostics	No restrictions
2500 Series DSU (DATAPHONE II)	2500 loopbacks on a point-to-point network; no diagnostics on a multipoint network (primary channel compatibility only)	19.2 DDS, 38.4, 64 LADS, 64 CC
2600 Series DSU (DATAPHONE II)	2600 diagnostics (3510 tributary only)	19.2 DDS, 38.4, 64 LADS, 64 CC
3456 DSU	No diagnostics (primary channel compatibility only)	64 CC
3056 DSU	No diagnostics (primary channel compatibility only)	14.0, 19.2 DDS, 28.0, 38.4, 64 LADS, 64 CC

2600 Series Compatibility

3500 Series DSUs have no network management capabilities except when they are used as tributaries in DATAPHONE 2600 Series networks.

In this application, the functions controlled by the NMS include the following:

- DSU enable/disable
- Test pattern transmission
- Loopback testing
- Digital testing
- Abort

Figure 2-2 illustrates how a COMSPHERE 6800 Series, DATAPHONE II, or ANALYSIS network management system (NMS) sends messages to a 2600 Series shared diagnostic unit (SDU) which, in turn, causes a 2600 Series DATAPHONE II DSU to send the above commands to a tributary Model 3510 DSU via the digital network.

Local Area Data Set (LADS) Operation

Both the 3510 and 3511 Models can be connected to 4-wire, nonloaded metallic pairs. In this application (Figure 2-3), the DSUs are used as point-to-point local area data sets (LADS). (See Table 4-2 in Chapter 4.)

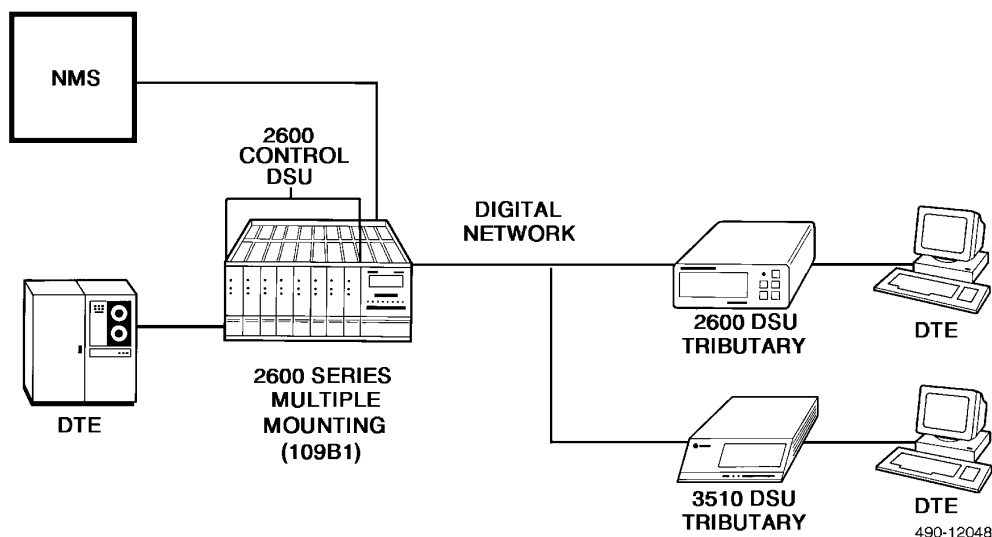


Figure 2-2. Multipoint DATAPHONE II 2600 DSU Network

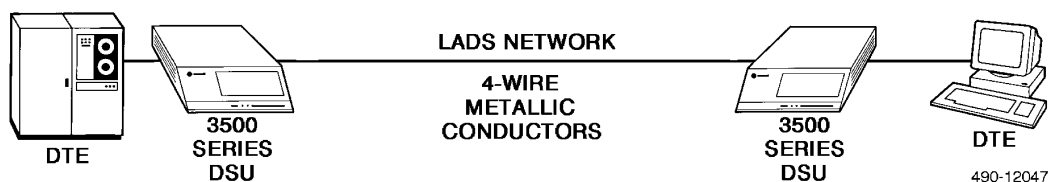


Figure 2-3. Local Area Data Set Connectivity

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Overview

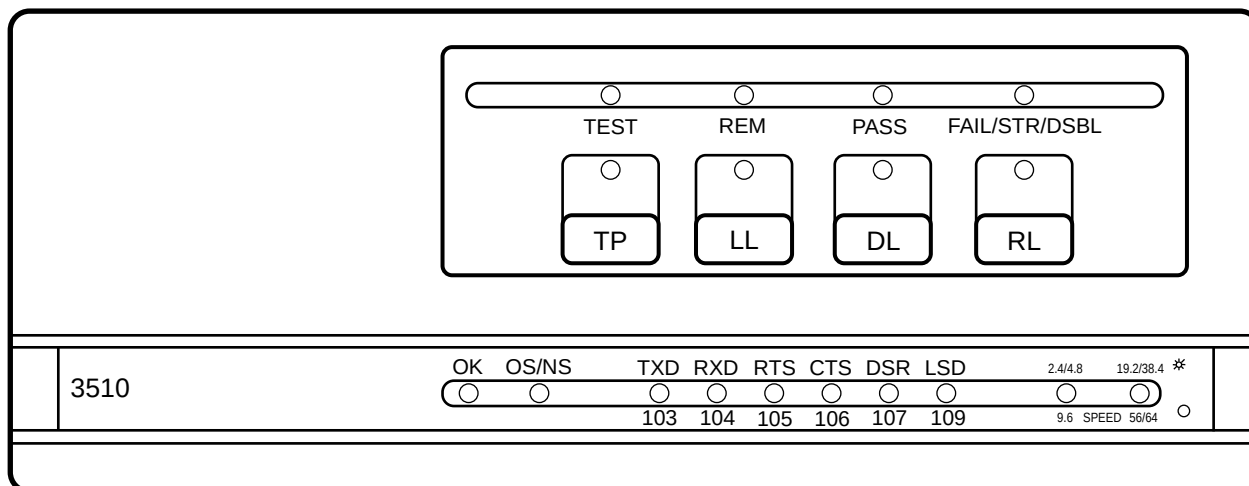
You can determine operation of the digital network when it contains 3500 Series DSUs by examining the DSU's faceplate status indicators and evaluating the response to diagnostic tests. These tests are used to isolate problems when they occur, and to verify that problems have been successfully corrected.

Use the controls and indicators on the standalone and carrier-mounted DSUs to operate the units and control the network. The faceplate on both the Model 3510 and Model 3511 contains 18 light-emitting diodes (LEDs) and four pushbutton switches.

The LED indicators light to show the status of certain diagnostic operating functions, or to indicate the status of the leads of the DTE interface (TXD through LSD). Use the four pushbutton switches to run various diagnostic tests.

Model 3510 Faceplate

Figure 3-1 shows the 18 indicators and 4 pushbutton switches on the Model 3510 faceplate. These indicators and switches are listed in Table 3-1, and their functions described.



496-12301-01

Figure 3-1. Model 3510 Faceplate

Table 3-1
(1 of 3)
3500 Series Indicators and Switches

Name	Definition	Function
OK	Normal Operation	This green indicator lights when the DSU is connected to the digital network or LADS and is operating normally. It goes Off if the OS/NS alarm indicator is active. ¹
OS/NS	Out-of-Service/No Signal	This red indicator signals a network failure: OS – Slow flash when Out-of-Service or Out-of-Frame messages are received from the network. NS (No Signal) – Rapid flash when DSU is not receiving signals from the network.
TEST	Test	This yellow indicator lights whenever the digital network or a remote DSU initiates testing, or the local TP, LL, DL, or RL key is pressed to start testing. The test indicator flashes while tests are being set up or taken down.
REM	Remote	This yellow indicator lights whenever a test request is received from a remote DSU or the digital network.
¹ If the DSU has been placed in a Network Loopback, then both the OK and OS/NS indicators will be lit (the TEST and REM indicators will also be lit).		

Table 3-1
(2 of 3)
3500 Series Indicators and Switches

Name	Definition	Function
PASS	Pass	This green indicator lights if the DSU has completed a device test without a failure. The indicator remains on until another key is pressed.
FAIL/STR/DSBL (3510) Dsbl/Fail (3511)	Failure/Error/Streaming/Disable	This red indicator performs four functions: FAIL/Dsbl (3510/3511) – Indicator lights at the end of a Device Test if the test was not successful. The indicator remains ON until another key is pressed. Fail (3511) – This indicator rapid flashes during Test Pattern when errors are detected. DSBL (3510) – Indicator lights if the DSU has been disabled. STR (3510) – Indicator slow flashes when a streaming terminal alarm condition exists. (NOTE: The RTS indicator will also be ON.)
TP	Test Pattern	This yellow indicator lights when the test pattern generator/comparator circuit is active. Press the TP pushbutton switch to generate a local test pattern.
LL	Local Loopback	This yellow indicator lights when the DSU is in local loopback. Press the LL pushbutton switch to initiate a local loopback test.
DL	Digital Loopback	This yellow indicator lights when the DSU is performing a digital loopback or a channel loopback. Press the DL pushbutton switch to initiate a local digital or channel loopback test.
RL	Remote Loopback	This yellow indicator lights when a remote digital loopback has been requested of the remote DSU. Press the RL pushbutton switch to initiate a digital loopback test at the remote end.
TXD (103) ²	Transmit Data	This green indicator is steady-ON when MARKS are transmitted, goes Off when spaces are transmitted, and flashes at a steady rate when variable data are transmitted.
RXD (104) ²	Receive Data	This green indicator is steady-ON when marks are being received, goes Off when spaces are received, and blinks at a steady rate when variable data are received.
² CCITT designation.		

Table 3-1
(3 of 3)
3500 Series Indicators and Switches

Name	Definition	Function
RTS (105) ²	Request-to-Send	This green indicator lights when the DTE places a positive voltage on the RTS input. ³
CTS (106) ²	Clear-to-Send	This green indicator lights when the DSU places a positive voltage on the CTS lead. ³
DSR (107) ²	Data Set Ready	This green indicator lights when the DSU places a positive voltage on the DSR lead. ³
LSD (109) ²	Line Signal Detect	This green indicator lights when the DSU detects the proper signal from the digital network and places a positive voltage on the LSD lead. ³
2.4/4.8 (9.6)	Data Rate (SPEED)	This green indicator flashes when the DSU has been configured for a data rate of 2400 or 4800 bps. If the indicator is steady-ON, the DSU has been configured at 9600 bps.
19.2/38.4 (56/64)	Data Rate (SPEED)	This green indicator flashes when the DSU has been configured for a data rate of 19,200 or 38,400 bps. If the indicator is ON, the DSU has been configured at 56,000 bps or 64,000 bps.
² CCITT designation. ³ May light during testing in response to internal logic states.		

Model 3511 Faceplate

Figure 3-2 shows the Model 3511 faceplate. Indicators and pushbutton switches for this DSU are listed and described in Table 3-1.

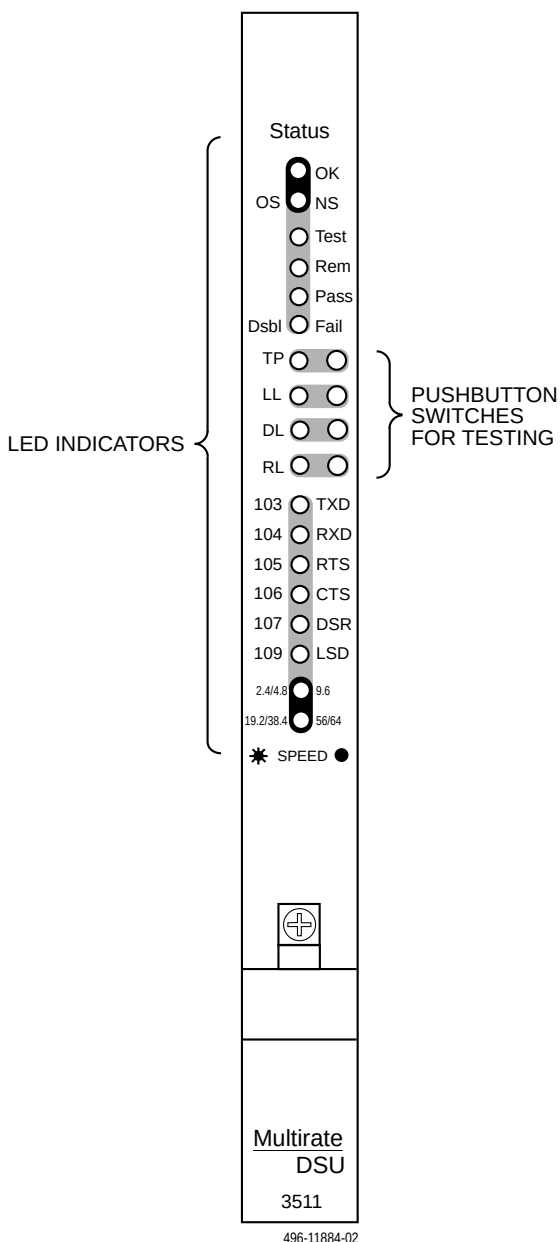


Figure 3-2. Model 3511 Faceplate

Faceplate Operation

Table 3-1 provides operation descriptions for the eight DSU status indicators, the four pairs of test switches and test indicators, and the six DTE interface indicators for both the 3510 and 3511 DSUs. The status indicators are always active as long as the DSU is functioning properly and has power; however, you can choose to disable the four test switches via a DSU option in order to prevent unauthorized testing.

Diagnostic Tests

Use diagnostic tests as part of the installation procedure to verify proper operation of the DSU, and in response to service outages to sectionalize the failure to the DSU, Network, or DTE.

This section describes test procedures to use when all DSUs on the network are combinations of 3500 or 2500 DSUs. Refer to the *2600 DSU Emulation* section when testing 2600/3500 mixed networks.

If the DSU timing straps (S1-1 and S1-2) have been set to a setting other than DDS, timing may change during some tests. Appendix B shows these changes.

Device Test

Device Test is a data disruptive test that tests the functionality of the DSU.

Device Test Overview

This 30-second test uses a test pattern generator built into the DSU. The test does not require any other equipment. The generator sends a test message to the

DSU transmitter where it is looped back to the receiver (Figure 3-3). The receiver then passes the test message it receives to the comparator. The comparator checks the received message for errors. Errors cause the faceplate Dsbl/Fail (3511) or FAIL/STR/DSBL (3510) indicator to flash. At the conclusion of the test, the PASS or FAIL indicator lights.

To start the test, press the LL and TP test switches. To end the test, press the TP and LL test switches after the test result indicator appears.

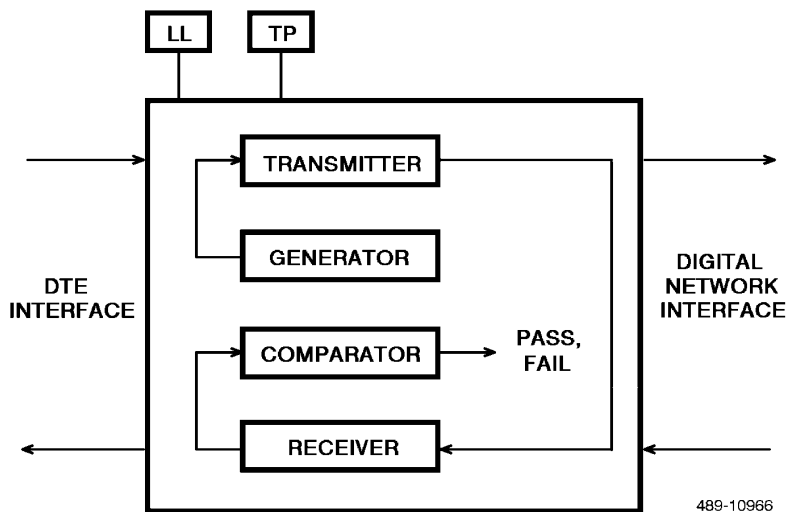


Figure 3-3. Device Test Diagram

Device Test Procedures

Follow the procedure in Table 3-2 for a Device Test.

The DTE and network cables are not required to be connected to the DSU to do this test. However, the DSU must be powered.

Device Test Results

If, at the conclusion of the Device Test, the PASS indicator is lit, then the DSU has passed the test and has a very high probability of not being the source of trouble. If the FAIL indicator is lit, the DSU has failed the Device Test and should be replaced.

Table 3-2
Device Test Procedure

Your Action	Local DSU Front Panel Response
1. Press the LL test switch.	LL indicator lights. TEST flashes for 6 seconds and then remains ON.
2. Press the TP test switch.	TP indicator lights. TXD and RXD indicators flash. * If errors are detected, the FAIL indicator flashes or remains ON. After about 30 seconds, the TEST finishes and PASS or FAIL appears. TXD and RXD continue to flash.
3. Press the TP test switch.	TP indicator goes Off. TXD and RXD indicators now show interface lead status.
4. Press the RL test switch.	RL indicator goes Off. TEST flashes for 6 seconds and goes Off.
5. Press the LL test switch.	LL indicator goes Off. TEST flashes for about 6 seconds, then goes off.
* During this test, TXD, LSD, and RXD DTE interface indicators monitor internal versions of the corresponding interface lead.	

Digital Test (Point-to-Point)

Digital Test is a data disruptive test used to determine if both DSUs and the DDS (Digital Data Service) network between the DSUs are functioning properly (Figure 3-4).

Point-to-Point Digital Test Overview

After the remote DSU is put in Digital Loopback, this test uses a test pattern generator that is built into the local DSU. The generator sends a test message over the network to a remote DSU where it is looped back (Figure 3-4). The local DSU passes the received test message to the comparator. The comparator checks the message for errors. Isolated errors cause sporadic flashes of the local DSU front panel FAIL indicator. Steady errors cause the FAIL indicator to flash continuously.

The DTE cable for each DSU is not required to be connected to do this test. However, to do this test, each DSU must be powered on, connected to the network, and the network line must be functional. The remote DSU must be configured to allow remote Digital Loopback testing (S1-6 open), or the test will fail.

Press the Remote Loopback (RL) and test pattern (TP) test switches to start test at the local DSU. The test does not require an attendant at the remote DSU location.

When the test is completed, press the RL and TP test switches to return the DSU to normal.

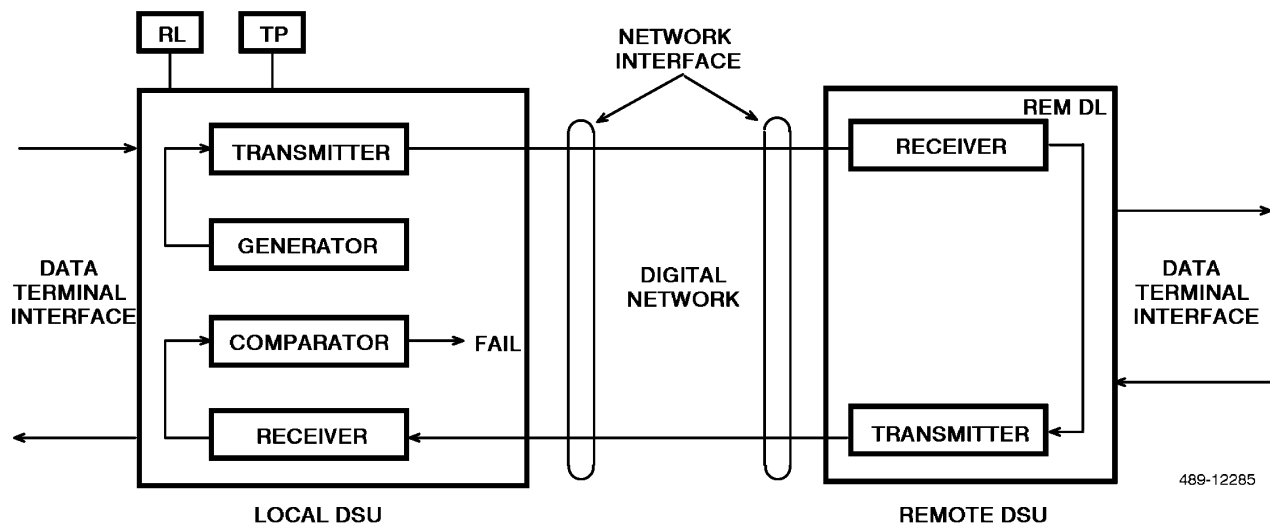


Figure 3-4. Digital Test (Point-to-Point) Diagram

Point-to-Point Digital Test Procedures

Follow the procedure in Table 3-3 to perform a Digital Test (Point-to-Point).

Point-to-Point Digital Test Results

If the FAIL indicator remained Off for the entire test interval, the Digital Test has passed and no problems have been detected in either the DSUs or the network. If the FAIL indicator flashed sporadically, you may have experienced network-related data errors. If the FAIL indicator flashed continuously, there is a hard failure in either a DSU or the network.

Table 3-3
Digital Test (Point-to-Point) Procedure

Your Action	Local DSU Front Panel Response
1. Press the RL test switch.	RL indicator lights. TEST flashes for 6 seconds and then remains ON.
2. Press the TP test switch and run the test for the desired test interval.	TP indicator lights. TXD and RXD indicators flash.* Look for FAIL flashes during the test interval.
3. Press the TP test switch.	TP indicator goes Off. TXD and RXD now indicate interface lead status.
4. Press the RL test switch.	RL indicator goes Off. TEST flashes for 6 seconds and goes Off.
* During this test, TXD, LSD, and RXD DTE interface indicators monitor internal versions of the corresponding interface lead.	

Digital Test (Multipoint)

Digital Test is a data disruptive test used to determine if the control DSU, one selected tributary DSU, and the multipoint network between these two DSUs are functioning properly. This test requires a person at each end, and the tester should be sure that no other tributary will originate a transmission during the test, as this will invalidate the test.

Multipoint Digital Test Overview

After the remote DSU is manually put in the Digital Loopback, this test uses a test pattern generator built into the local DSU. The generator sends a test message over the network to a remote DSU where it is looped back (Figure 3-5). The local DSU passes the received test

message to the comparator. The comparator checks the message for errors. Isolated errors cause single flashes of the local DSU front panel FAIL indicator. Steady errors cause the FAIL indicator to flash at a six times per second rate.

The DTE cable for each DSU is not required to be connected to do this test. However, to do this test, each DSU must be powered on, connected to the network, and the network line must be functional.

The test requires an attendant at the tributary location to press the DSU DL test switch. The person must be contacted to establish the test starting time and duration. To start the test, press the TP test switch at local DSU and the DL test switch at the remote DSU. Look for FAIL indicator flashes during the test. To end the test, press the local DSU TP and the remote DSU DL test switches.

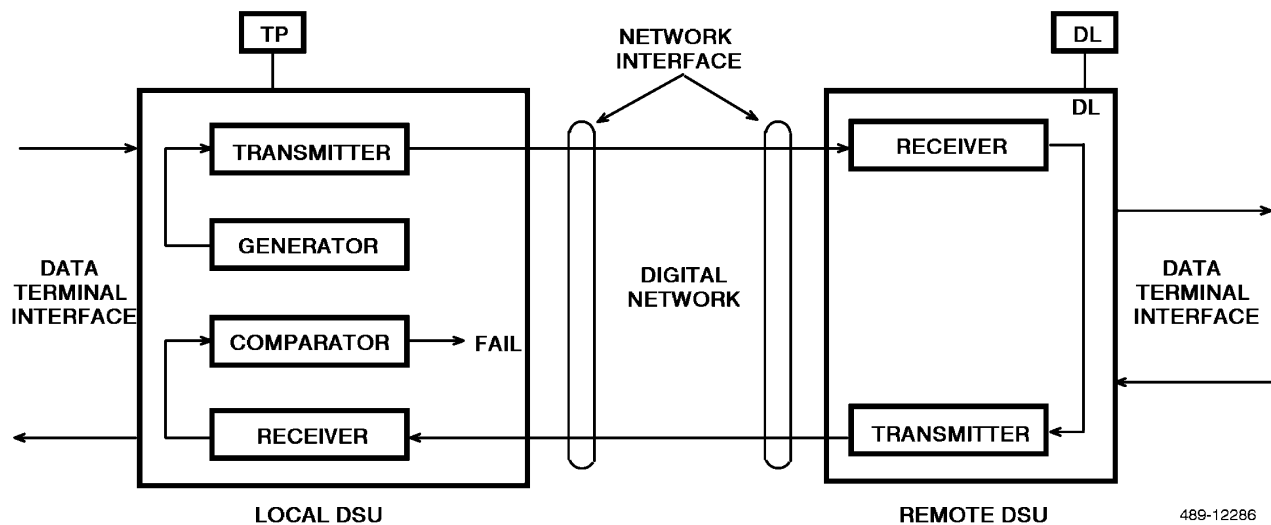


Figure 3-5. Digital Test (Multipoint) Diagram

Multipoint Digital Test Procedures

Follow the procedure in Table 3-4 to perform a Digital Test (Multipoint).

Multipoint Digital Test Results

If the FAIL indicator remained Off for the entire test interval, the Digital Test has passed and no problems have been detected in either the DSUs or the network. If the FAIL indicator has flashed sporadically, you may have experienced network-related data errors. If the FAIL indicator has flashed continuously, there is a hard failure in either a DSU or in the network.

Table 3-4
Digital Test (Multipoint) Procedure

Your Action	Control DSU Front Panel Response
1. Call tributary DSU location, agree on test, duration of test, and request DL test switch be pressed.	—
2. Press the TP test switch and run the test for the desired test interval.	TP and TEST indicators light. TXD and RXD indicators flash.* Count number of FAIL flashes during the test interval.
3. Press the TP test switch.	TP and TEST indicators now go Off. TXD and RXD indicators indicate interface lead status.
4. Call remote DSU location and request DL test switch be pressed.	—
* During this test, the TXD, LSD and RXD DTE interface indicators monitor internal versions of the corresponding interface lead.	

Local Loopback – DTE Test Message

The Local Loopback is a data disruptive test used to determine the proper functioning of the DTE to DSU connection.

Local Loopback Overview

This loopback uses a test message provided by your DTE. The DTE sends the message to the DSU's transmitter, where it is looped back to the receiver and returned to the DTE (Figure 3-6). Check the returned message for errors. Errors should be detected, appropriately reported, and the problem cleared. The DSU front panel does not display the test results.

Make sure the DTE cable is connected to the DSU and the DSU is powered on. The DSU is not required to be connected to the network.

To start the loopback, press the LL test switch; the DTE sends the test message. To return the DSU to normal after the loopback result is determined, press the LL test switch.

Local Loopback Procedures

Follow the procedure in Table 3-5 or Table 3-6 to perform a Local Loopback – DTE Test Message.

Local Loopback Results

For proper operation, the test message should be received error free.

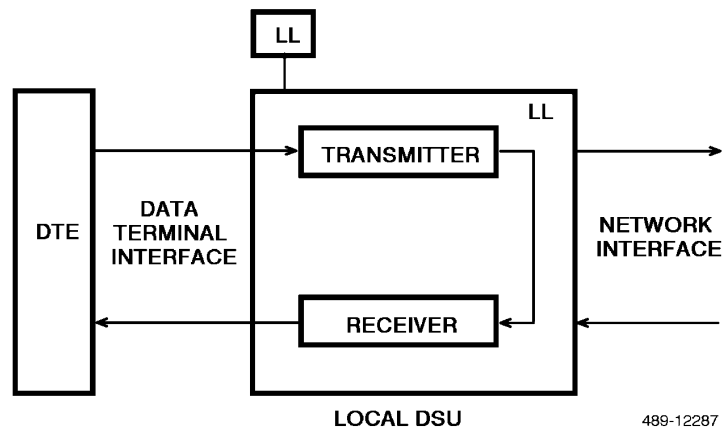


Figure 3-6. Local Loopback – DTE Test Message Diagram

Table 3-5
Local Loopback – DTE Test Message Procedure

Your Action	DSU Front Panel Response
1. Press the LL test switch.	LL indicator lights, TEST indicator flashes. After about 6 seconds, TEST indicator remains ON.
2. Operate your DTE to send test message.	TXD and RXD indicators show interface lead status while test message is transmitted.
3. Press the LL test switch.	LL indicator goes Off. TEST flashes for about 6 seconds, then goes Off.

Table 3-6
Local Loopback – DTE Test Message Alternative Procedure

Your Action	DSU Front Panel Response
1. DTE turns on Pin 18 of the EIA interface or Pin LL of the V.35 interface* which causes the DSU to perform a Local Loopback.**	LL indicator lights, TEST indicator flashes. After about 6 seconds, TEST indicator remains ON.
2. DTE sends test message.	TXD and RXD indicators show interface lead status while test message is transmitted.**
3. DTE turns off Pin 18 or Pin LL to restore DSU to normal.	LL indicator goes Off. TEST flashes for about 6 seconds, then goes Off.
* Pin 18 of the EIA interface or Pin LL of the V.35 interface will not function unless straps S3-3 and S3-4 are enabled. ** DSR EIA output and the indicator goes Off during LL unless strap S5-5 (DSR always ON) is enabled.	

Channel Loopback

The Model 3510 and 3511 DSUs perform a Channel Loopback test whenever they detect reversal of the sealing current in the local loop. In addition, these DSUs connected to subrate or 56 kbps DDS local loops respond to network loopback bipolar violation sequences by performing a channel loopback, returning incoming data to its source via the digital network (shown in Figure 3-7). DSUs optioned for 64 kbps CC operation will respond to DDS network latching loopback sequences.

While a channel loopback is underway, the yellow REM, TEST, and DL indicators light, and the red OS/NS and the green OK indicators are on, showing that the digital network is carrying a Network Loopback/OOS (Out-of-Service) message.

Troubleshooting

Additional diagnostic testing can be performed to troubleshoot and correct out-of-service, no signal, and streaming terminal conditions that occur on the digital network. Figure 3-8 is a flowchart for troubleshooting an OOS condition. Figure 3-9 is a flowchart for troubleshooting a No Signal condition. Figure 3-10 is a flowchart for troubleshooting a streaming condition.

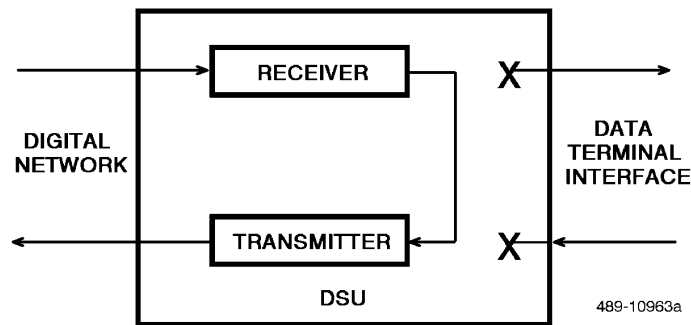
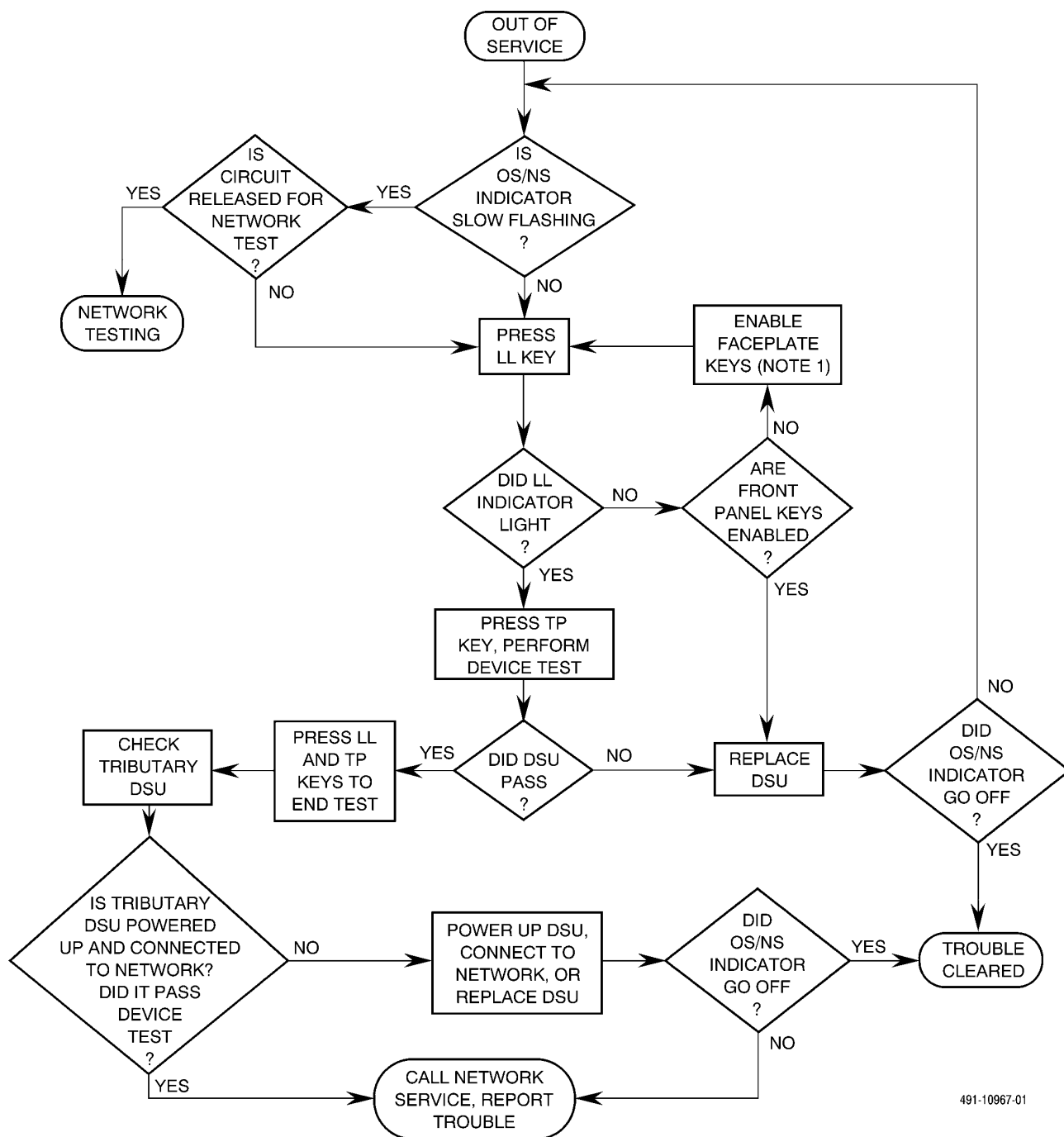


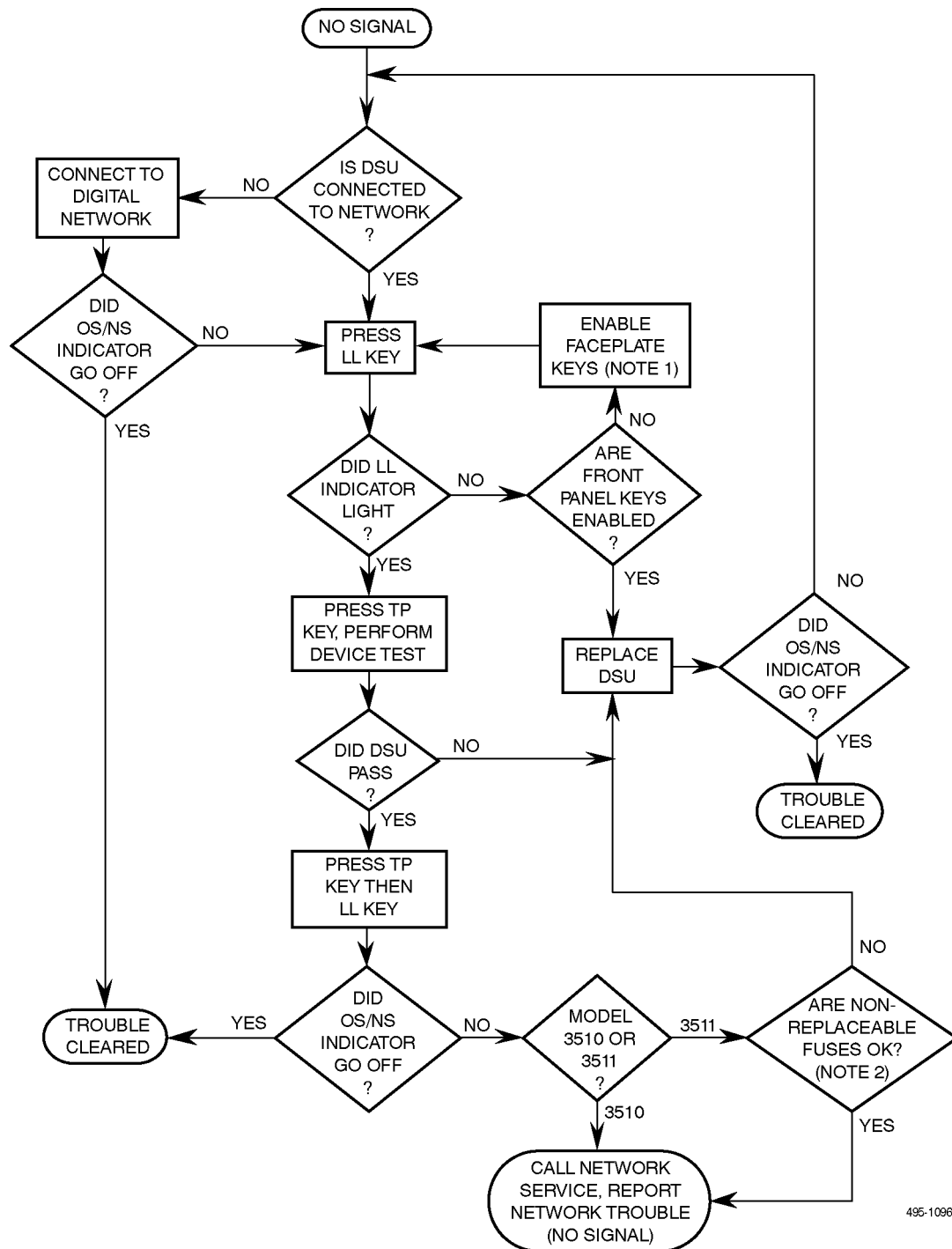
Figure 3-7. Channel Loopback Diagram



NOTE:

1. IF KEYS ARE DISABLED TO PREVENT INTERFERING WITH THE DIGITAL NETWORK, CHECK BEFORE ENABLING AND BE SURE TO DISABLE AFTER TESTING IS COMPLETED.

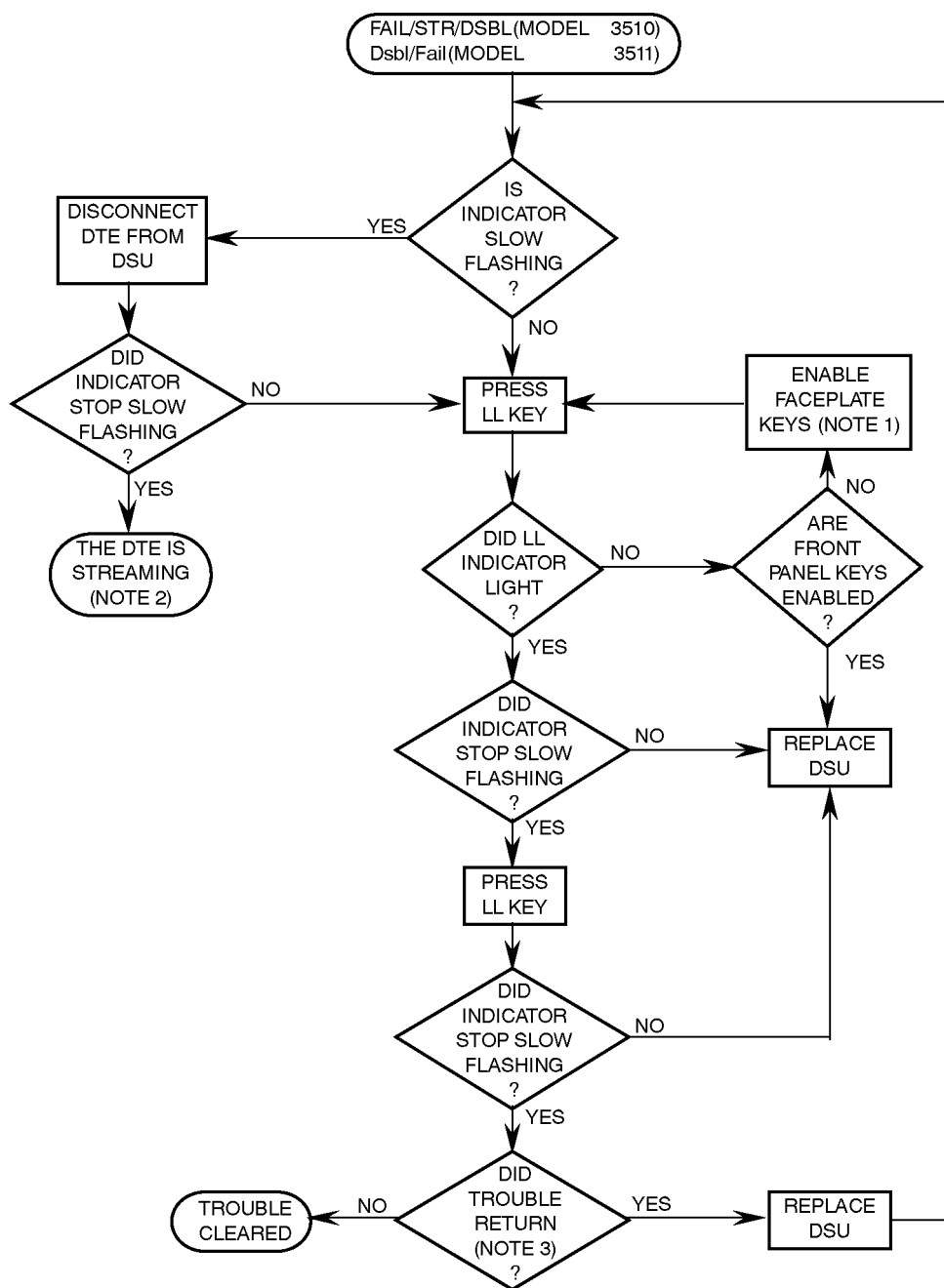
Figure 3-8. Out-of-Service Condition Troubleshooting Flowchart



NOTES:

1. IF KEYS ARE DISABLED TO PREVENT INTERFERING WITH THE DIGITAL NETWORK, CHECK BEFORE ENABLING AND BE SURE TO DISABLE AFTER TESTING IS COMPLETED.
2. CHECK THE SIX GLASS PIGTAIL FUSES ON THE MODEL 3511 CIRCUIT CARD (FIGURE 4-7). IF THE WIRE FILAMENT IN ANY OF THE SIX IS BROKEN, THE FUSE IS BAD AND THE CARD MUST BE REPLACED.

Figure 3-9. No Signal Condition Troubleshooting Flowchart



491-10969-01

NOTES:

1. IF KEYS ARE DISABLED TO PREVENT INTERFERING WITH THE DIGITAL NETWORK, CHECK BEFORE ENABLING AND BE SURE TO DISABLE AFTER TESTING IS COMPLETED.
2. VERIFY THAT THE DSU CONTINUOUS REQUEST TO SEND AND STREAMING OPTION SETTINGS ARE CORRECT FOR THE APPLICATION.
3. DID TROUBLE RETURN AFTER STREAMING TIMEOUT ELAPSED? (3 SEC. AT 38,400, 56,000 AND 64,000 bps; OTHERWISE 27 SEC.)

Figure 3-10. Streaming Terminal Condition Troubleshooting Flowchart

2600 Series DSU Emulation

Several tests are available to an network management system (NMS) user to investigate trouble conditions on a circuit with 2600 DSUs.

Disruptive Test and Control Commands

As a result of abnormal status condition or a trouble report from another source about a 2600 circuit, the NMS operator can perform one or more of the following disruptive tests:

- **Abort Test:** This command aborts or stops any ongoing test or test configuration in which a 2600 DSU is involved. It is effective for conditions initiated by the NMS.
- **Digital Test:** A timed Digital Test of specified length can be performed on a multipoint circuit between the control DSU and a designated tributary DSU. At the start of this test, all tributary DSUs are placed in Test mode, and then the designated tributary DSU is placed into Digital Loopback. The control DSU then sends the test pattern and compares the returned signal for errors. If no errors are found, the test passes. This means a signal was successfully sent from the control DSU through the DDS network, to the designated tributary DSU, and back again. Thus, a problem on the circuit is probably in the remote terminal equipment.

On multipoint networks, the tributary DSUs that are not involved in the Digital Test are placed in Test mode for the duration of the test. During Test mode, the DSU's transmitter is disabled to prevent potential interference with the Digital test.

The tributary DSU front panel indicators are in the following configurations during a Digital Test:

Specified Tributary DSU – Remote Loopback

REM indicator slow flash
TEST indicator ON
DL indicator ON

Other Tributary DSUs – Test Mode

REM indicator slow flash
TEST indicator ON

- **DSU Disable/Enable:** A 3510 DSU can be disabled from an NMS. When the DSU is disabled, it ignores signals on its send data and request-to-send leads and clamps its received data signal to MARK. This is the same condition as in the Test mode. The difference between a DSU being disabled and placed in Test mode is the method of restoring the DSU to a normal mode. The DSUs in Test mode are restored when the test is concluded or aborted; DSUs in Disable mode are only restored when an enable command is received. Disabling DSUs is useful when the terminal equipment is not ready for service or when multiple terminals have been assigned the same polling address.

Disabled Tributary

FAIL/STR/DSBL indicator ON
REM indicator slow flash

- **Loopback Commands:** A 3510 DSU can be placed in a Remote Digital Loopback from the NMS. This permits the DSUs to be tested with external test equipment, to be tested by special test messages sent and checked by a host computer.

Tributary In Loopback

REM indicator slow flash DL indicator
ONTEST indicator ON

- **Transmit Test Pattern:** This command is used to cause a 3510 tributary DSU to transmit its test pattern. If the other end is also placed in Test pattern, it is possible to conduct an End-to-End Test and isolate marginal troubles to the send or receive direction.

Tributary in Test Pattern

REM indicator slow flash
TP indicator ON
TEST indicator ON

Installation 4

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Overview

This chapter contains installation procedures for configuring and installing the Model 3510 and Model 3511 DSUs.

Installation Planning

Your installation site should be clean, well-lighted, well-ventilated, and free from environmental extremes. Allow 2 to 3 feet of clearance at the front and rear of the unit for access and cable connections during installation.

NOTE

Before connecting the DSU to the DDS network, ensure that approved primary protectors have been installed on the circuit in accordance with Article 800 of the National Electric Code, NFPA 70, in the United States and Section 60 of the Canadian Electric Code, Part 1, in Canada.

NOTE

DSUs can be operated only at the data rate for which access to the digital network is provided by the telephone company.

Model 3510 DSUs

Model 3510 DSUs must be installed within 6 feet of a grounded ac outlet controlled by a circuit breaker and capable of furnishing 90 to 132 Vac, 0.07 amps at 117 Vac. Specific DSU placement depends upon your requirements.

Model 3511 DSUs

The Model 3511 DSU is designed for installation in a COMSPHERE 3000 Series Carrier, which supplies operating power and provides interfaces for connecting to the digital network. Up to 16 DSUs can be installed in a COMSPHERE 3000 Series Carrier. For installation of the carrier, refer to the *COMSPHERE 3000 Series Carrier, Installation Manual*.

If installing additional units in a COMSPHERE 3000 Series Carrier that does not contain a fan module, you may need to install one to dissipate heat. Use Table 4-1 to determine if fan modules are necessary. This table lists the fan module cooling requirements if your carrier consists totally of Model 3511 DSUs. If your carrier contains a mixture of circuit cards, see the *COMSPHERE 3000 Series Carrier, Installation Manual* for fan module cooling requirements and instructions for installing the fan module.

Important Safety Instructions

Read and follow all warning notices and instructions marked on the DSU or included in this guide.

If you have a standalone Model 3510 DSU, do not attempt to service it yourself, as removal of the case will expose you to dangerously high voltage points or other risks. Refer all servicing to qualified personnel (see the *Equipment Warranty and Support* section in Chapter 1).

HANDLING PRECAUTIONS FOR STATIC-SENSITIVE DEVICES

This product is designed to protect sensitive components from damage due to electrostatic discharge (ESD) during normal operation. When performing installation procedures, however, take proper static control precautions to prevent damage to equipment. If you are not sure of the proper static control precautions, contact your nearest sales or service representative.

For additional safety instructions, see the *Important Safety Instructions* section, Page B at the front of this guide.

**Table 4-1
Fan Module Cooling Requirements**

Ambient Temperature Range	Number of Fan Modules Required	
	1 to 5 Carriers	6 Carriers
38—80° F (33—26.7° C)	No fan module	1 fan module (place in second carrier from top of cabinet)
80—112° F (26.6—44.5° C)	1 fan module per carrier	1 fan module per carrier

Installation Procedures

This section provides instructions for installing standalone Model 3510 DSUs and carrier-mounted Model 3511 DSUs. Refer to the appropriate section.

Model 3510 DSUs

Physical installation of the Model 3510 consists of unpacking the DSU and placing it in its planned location. Electrical installation requires the following procedure.

Procedure

1. Coordinate the installation with the telephone company and affected digital network user locations. (Refer to the *Government Requirements* section at the front of this manual to ensure compliance with FCC or Canadian rules.)
2. Configure the DSU to meet the requirements of the application* (refer to the *Hardware Strapping* section later in this chapter).
3. Find a suitable non-switched ac wall outlet capable of furnishing 90 to 132 Vac, 0.07 amps at 117 Vac. Label the circuit breaker that controls the outlet and be sure it is set to ON.
4. At the rear panel of the DSU (Figure 4-1), insert the socket (female) end of the power cable into the POWER receptacle. Ensure that the connector is fully inserted. Connect the other end to the ac outlet.

Indicators on the faceplate flash as the DSU performs an internal power-on self-test. The green OK indicator then lights for about 20 seconds, then the red OS/NS indicator flashes. If no indicators light, verify that the DSU is receiving power.

5. Perform the Device Test as described in the *Operation* section of this manual. If the DSU fails this test, replace the DSU.

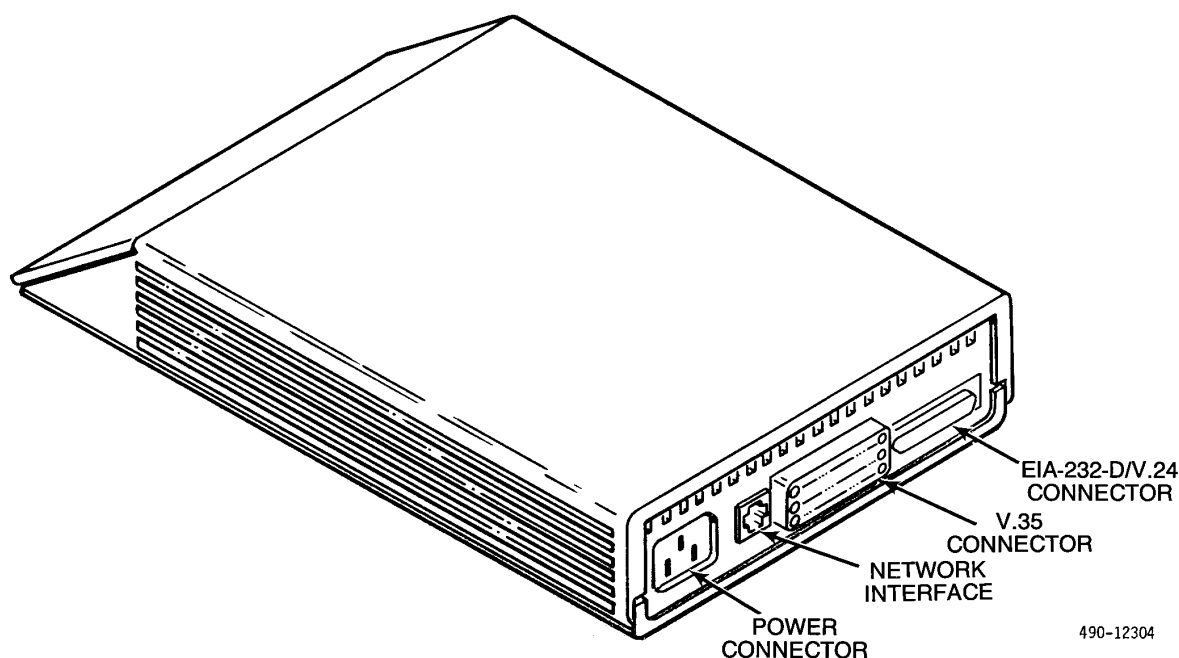


Figure 4-1. Model 3510 DSU, Rear Panel

* If you wish to disable the faceplate switches, do not disable them yet or you will not be able to test the DSU properly.

6. Connect the network interface. Refer to the *Notice to Users of the Digital Data Service* (page D at the beginning of this manual) to ensure compliance with FCC or Bell Canada rules, and for information required to obtain the desired service from the telephone company.

The Model 3510 DSU's rear panel contains a miniature universal service ordering code (USOC) type RJ48S jack for connecting your DSU to the digital network (see Figure 4-1). Purchasers in the United States receive a modular telephone cable (D8W-87) with each DSU, with identical connectors on both ends. Canadian purchasers must order another cable (Feature Number 3000-B1-006) with a USOC-type RJ48S connector on one end and a 6-pin connector on the other.

7. Connect the DSU to the digital network by inserting the 8-pin end of the cable into the connector labeled LINE at the rear of the DSU.

Insert the other end of the cable into the modular jack provided by the telephone company. Make sure the OK indicator shows green and the OS/NS indicator stops flashing.

NOTE

For LADS applications, the OK indicator will not come on and the OS/NS indicator will flash until both DSUs are connected to the LADS circuit.

8. The DSU has an EIA-232-D/V.24 (ISO 2110) connector and a CCITT V.35 connector. EIA-232-D/V.24 is the factory default setting; Switch S3-6 on the CCA is positioned toward the front (F). Equipment speeds above 19.2 kbps typically use the V.35 interface.

To configure the DSU to use the V.35 interface, set Switch S3-6 on the CCA toward the rear (R) during configuration. Refer to the *Hardware Strapping* section for additional information.

NOTE

For the V.35 connector, the recommended maximum distance between a DTE and a DSU is nominally 1000 feet. For the EIA-232 connector, the effective shunt capacitance of the circuit, measured at the DSU, including the capacitance of the cable and the DTE, must not exceed 2500 picofarads, as specified in EIA-232-D.

9. Insert the plug end of the DTE cord into the appropriate DATA TERMINAL connector (EIA-232-D or V.35) at the back of the DSU. Connection of the DSU to the DTE is a matter of selecting and installing the appropriate cable.

Connect the other end of the DTE cord to your DTE.

10. If the network line and remote-end DSU are installed and tested, do a Remote Loopback – Test Pattern Test (Point-to-Point or Multipoint).
11. If the Front Panel test switches strap is to be disabled, do this now.

Installation of the standalone Model 3510 DSU is complete.

Removing and Replacing a Model 3510 DSU

To remove and replace the DSU:

Procedure

1. Disconnect the power cord – first from the outlet, then from the connector at the rear of the DSU.
2. Remove the D8W and DTE cables from the DSU.
3. If the DSU is to be removed from service and replaced, strap the replacement DSU the same as the old DSU.

If the DSU is defective and needs repair, record the defect on a tag and attach it to the DSU. Return the DSU, power cord, and network cord to the company per instructions included in the *Equipment Warranty and Support* section of Chapter 1.

4. If the DSU has been repaired, verify and change the strap settings, as necessary.
5. Continue with Steps 4 through 11 of the installation procedure.

Replacement of the Model 3510 DSU is complete.

Model 3511 DSUs

This section includes the installation procedures for the Model 3511 DSU, which is designed for installation in a COMSPHERE 3000 Series Carrier (Figure 4-2). These procedures assume that the carrier has been installed properly and is operational.

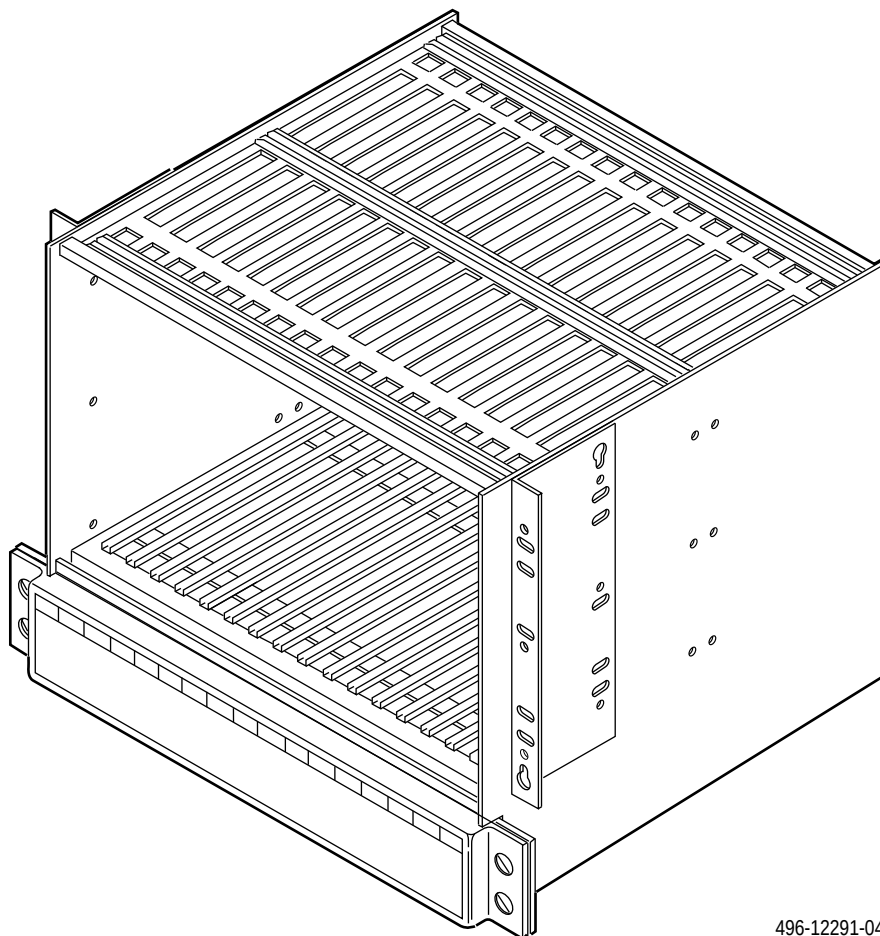
CAUTION

Discharge any static electricity that may be present on your body by touching a properly grounded object (e.g., cold water pipe, frame ground, or data cabinet). Do not handle the circuit card unnecessarily.

The initial installation procedure for the Model 3511 DSU requires the installation of a rear connector plate onto the rear of the COMSPHERE 3000 Series Carrier. After the initial installation, the DSU can be installed and removed from the front of the carrier without first disconnecting the DTE cables at the rear of the carrier. This section provides the initial installation procedure and the procedure for subsequent installations/deinstallations.

NOTE

When modular circuit cards are installed with non-modular cards in the same carrier, modular circuit cards like the Model 3511 DSU must be installed on the left side of the carrier (see Figure 4-3).



496-12291-04

Figure 4-2. Front View of the COMSPHERE 3000 Series Carrier

Installing the Rear Connector Plate

To install a DSU and its rear connector plate for the first time:

Procedure

1. Configure the DSU to meet the requirements of the application (refer to the *Hardware Strapping* section). Do not disable the front panel switches at this time.
2. At the rear of the carrier, set the tab on the rear connector plate into one of the slots on the carrier's backplane (Figure 4-3). Make sure the rear connector plate uses the same slot position intended for the DSU.
3. Loosely fasten the screw attached to the rear connector plate, allowing for slight adjustment that may be needed when installing the DSU.
4. Using a Phillips screwdriver, loosen the screw holding the circuit pack lock that secures the DSU's latch, and rotate the lock to the open position (Figure 4-4). Open the latch.
5. At the front of the carrier, hold the DSU vertically with the latch on its faceplate in the open position. Then, insert the circuit card into the top and bottom circuit card guides for the slot that contains the rear connector plate (see Figure 4-4).

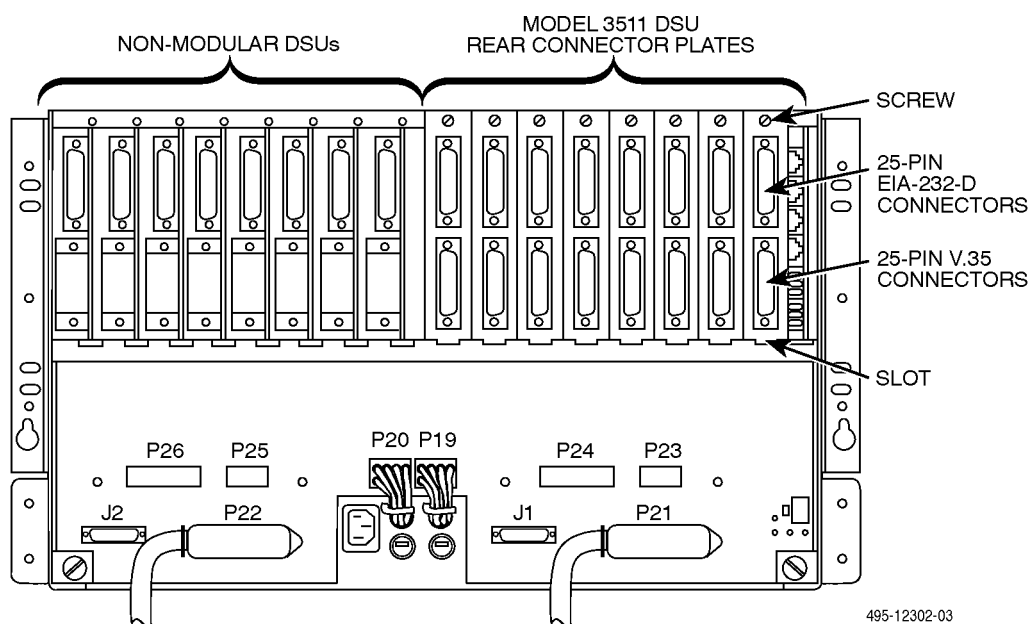


Figure 4-3. Rear View of the COMSPHERE 3000 Series Carrier

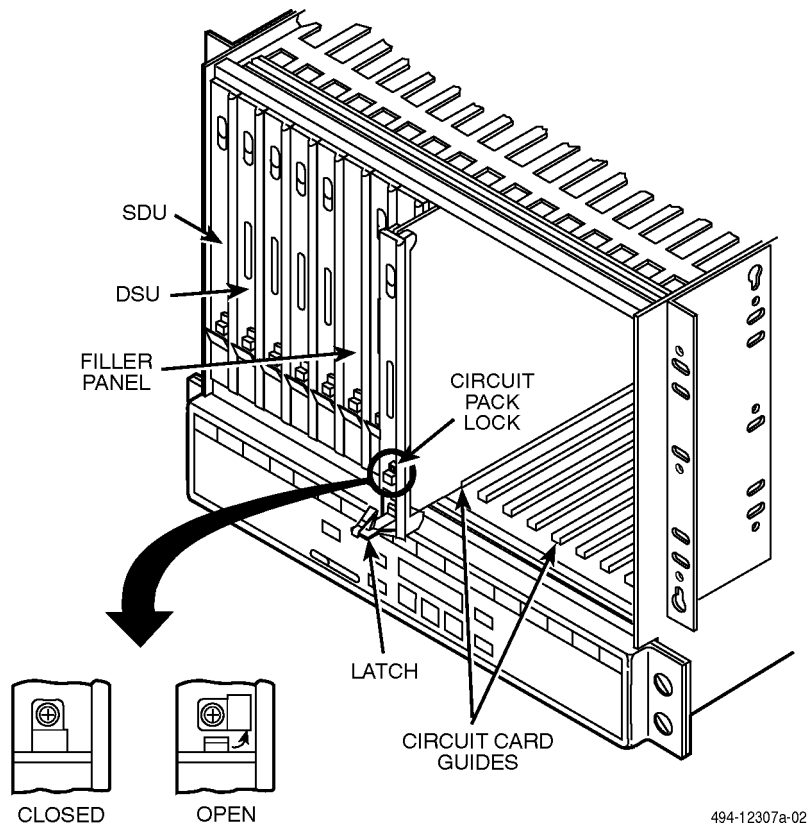


Figure 4-4. Model 3511 DSU Installation and Circuit Pack Lock

6. Aligning the circuit card with the rear connector plate, slide the DSU into the slot until the connectors seat firmly into the back of the carrier.
7. Press the faceplate latch to secure the DSU in the carrier, rotate the circuit pack lock into the closed position, and tighten the screw (Figure 4-4).

If the carrier is powered, all indicators on the faceplate flash as the DSU performs an internal power-on self-test. The green OK indicator then lights for about 20 seconds, then the red OS/NS flashes. If no indicators light, verify that the DSU is receiving power.

8. Return to the rear of the carrier and tighten the rear connector plate screw.
9. At the rear of the carrier, connect the DTE interface cable onto the rear connector plate (see Figure 4-3).

If using an EIA-232-D interface cable, connect the EIA-232-D cable to the top DTE connector on the rear connector plate.

If using a V.35 interface cable, proceed to the next procedure.

Installation of the DSU and its rear connector plate is complete.

Connecting to a V.35 Interface

To connect the V.35 interface cable:

Procedure

1. Connect the 25-pin end of the V.35 interconnect cable to the bottom DTE connector on the rear connector plate (refer to Figure 4-5). Use a small screwdriver to tighten the screws on both sides of the connector.
2. Connect the 34-pin end of the V.35 interconnect cable to the DTE's V.35 interface cable. Tighten the screws on both sides of the connector.

Installation of the V.35 interface cable is complete.

NOTE

For the V.35 connector, the recommended maximum distance between a DTE and a DSU is nominally 1000 feet. For the EIA-232 connector, the effective shunt capacitance of the circuit, measured at the DSU, including the capacitance of the cable and the DTE, must not exceed 2500 picofarads, as specified in EIA-232-D.

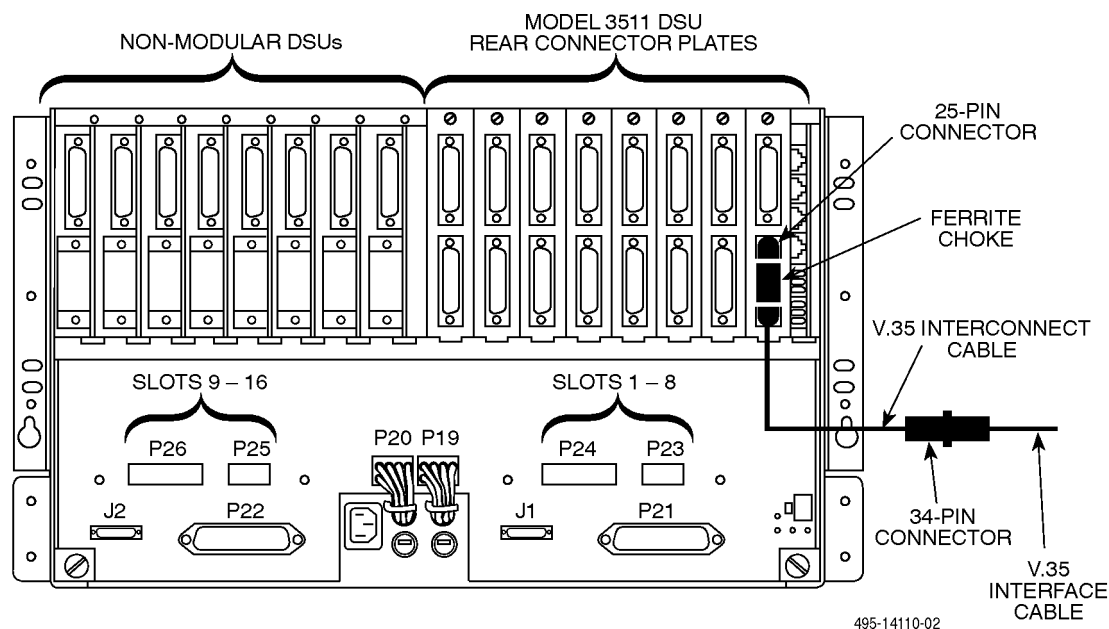


**Figure 4-5. Model 3511 DSU V.35 Interconnect Cable Installation
(Feature Number 3000-F1-510)**

Connecting to the Digital Network

The installed DSU is connected to the digital network through the 50-pin connectors on the rear of the carrier. These interfaces are specified in USOC RJ48T (pin assignments are shown in Appendix A). Proper network connection to the DDS facility or a network channel terminating equipment must be made at the far end of the cable.

To ensure proper network connection to the DDS facility or to network channel terminating equipment:

Procedure

1. If the network line and remote DSU are installed and tested, perform a Remote Loopback – Test Pattern Test (Point-to-Point or Multipoint).
2. If the Front Panel test switches strap is to be disabled, slide the DSU slightly out of the carrier, open Switch S3-1, then reseat the DSU into the carrier. Do this now.
3. Write circuit ID information in the area provided on the cover plate under the appropriate slot number.

The Model 3511 DSU and rear connector plate initial installation procedure is completed.

Installing a Model 3511 DSU

Before installing the DSU, whether being returned to service or following repair, verify strap settings and make adjustments that may be necessary.

To install a Model 3511 DSU after an initial installation:

Procedure

1. Using a Phillips screwdriver, loosen the screw holding the circuit pack lock, and rotate the lock to the open position (Figure 4-4). Open the latch.
2. At the front of the carrier, hold the DSU vertically with the latch on its faceplate in the open position.

Insert the circuit card into the top and bottom circuit card guides.

3. Aligning the circuit card with the rear connector plate, slide the DSU into the slot until the connectors seat firmly into the back of the carrier.
4. Press the faceplate latch to secure the DSU in the carrier, rotate the circuit pack lock into the closed position, and tighten the screw.

If the carrier is powered, all indicators on the faceplate flash as the DSU performs an internal power-on self-test. The green OK indicator then lights for about 20 seconds, then the red OS/NS flashes. If no indicators light, verify that the DSU is receiving power.

Installation of the carrier-mounted Model 3511 DSU is complete.

Removing a Model 3511 DSU

To remove a Model 3511 DSU:

Procedure

1. Using a Phillips screwdriver, loosen the screw holding the circuit pack lock, and rotate the lock to the open position (Figure 4-4). Open the latch.
2. Pull the latch out and down on the lower edge of the faceplate until the DSU starts to slide out. Pull the DSU free of the mounting.
3. If the DSU is to be removed from service, place the DSU in a protective ESD bag before storing.

If the DSU is defective and needs repair, place the DSU in a protective ESD bag, record the defect on a tag, and attach it to the bag. Return the DSU to the company per instructions included in the *Equipment Warranty and Support* section of Chapter 1.

Removal of the Model 3511 DSU is complete.

Local Area Data Set (LADS) Operation

You can connect 3500 Series DSUs to a 4-wire, non-loaded metallic circuit that functions as a point-to-point LADS. Factors that affect this type of installation are the data rate, the distance between LADS facilities, and the wire gauge. Table 4-2 summarizes the typical interrelationship of these factors.

Hardware Strapping

Both Model 3510 and 3511 DSUs can be configured for installation at the local or remote end of a network by setting onboard straps. The straps also allow you to configure either type of DSU (Model 3510 or 3511) as a LADS for connection to 4-wire metallic circuits.

Table 4-2
3500 Series DSU LADS Connection

Data Rate	Wire Gauge (AWG)			
	19	22	24	26
2.4	20.0 mi (32.2 km)	16.6 mi (26.7 km)	12.7 mi (20.5 km)	9.4 mi (15.1 km)
4.8	19.4 mi (31.2 km)	12.7 mi (20.5 km)	9.6 mi (15.4 km)	7.1 mi (11.5 km)
9.6	15.2 mi (24.5 km)	9.7 mi (15.6 km)	7.3 mi (11.7 km)	5.6 mi (9.0 km)
19.2	11.8 mi (19.0 km)	7.5 mi (12.1 km)	5.7 mi (9.2 km)	4.2 mi (6.8 km)
38.4	11.2 mi (18.0 km)	6.5 mi (10.5 km)	4.6 mi (7.4 km)	3.2 mi (5.1 km)
56	9.2 mi (14.8 km)	5.4 mi (8.7 km)	3.8 mi (6.2 km)	2.8 mi (4.5 km)
64	9.2 mi (14.8 km)	5.4 mi (8.7 km)	3.8 mi (6.2 km)	2.8 mi (4.5 km)

For the Model 3510 DSU, the straps are concealed behind the faceplate as shown in Figure 4-6.

To remove the faceplate to change the hardware straps:

Procedure

1. With your thumbs under the edge of the front bezel, firmly press upward to lift the bezel from the tabs securing it in place.
2. Swing the front bezel up and set the bezel aside.
3. Refer to the tables included in this section to determine which switches need to be changed. Then, using a small instrument, carefully change the position of the switches.
4. Reinsert the front bezel's hinge tabs into position and swing the bezel down. Snap the bezel back into place.

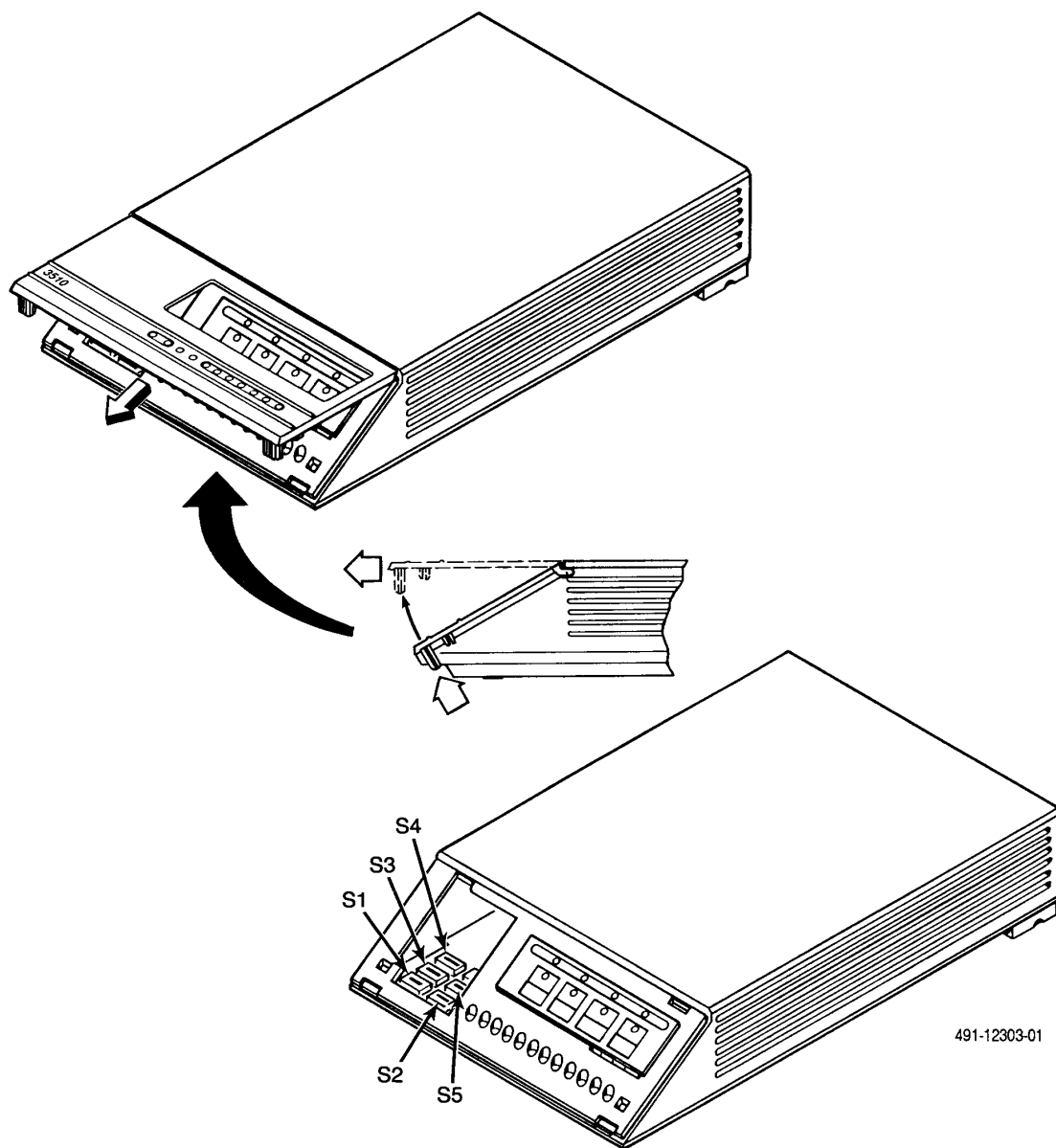


Figure 4-6. Model 3510 DSU Strap Access

Figure 4-7 shows the physical location of the straps on a Model 3511 DSU. The straps are not concealed, as they are on the Model 3510 DSU, and should be set before the DSU is installed in a COMSPHERE 3000 Series Carrier.

Factory strap settings for both the 3510 and 3511 DSUs are shown in Figure 4-8 and described in Figures 4-9 through 4-14. The straps for both models are listed and described in Tables 4-3 through 4-5. Table 4-6 lists all possible network addresses that can be selected by S4 strap settings.

NOTE

Location of the switch markings may vary. For clarification, switches positioned toward the front of the circuit card (F) are always Off, while switches positioned toward the rear (R) are always ON.

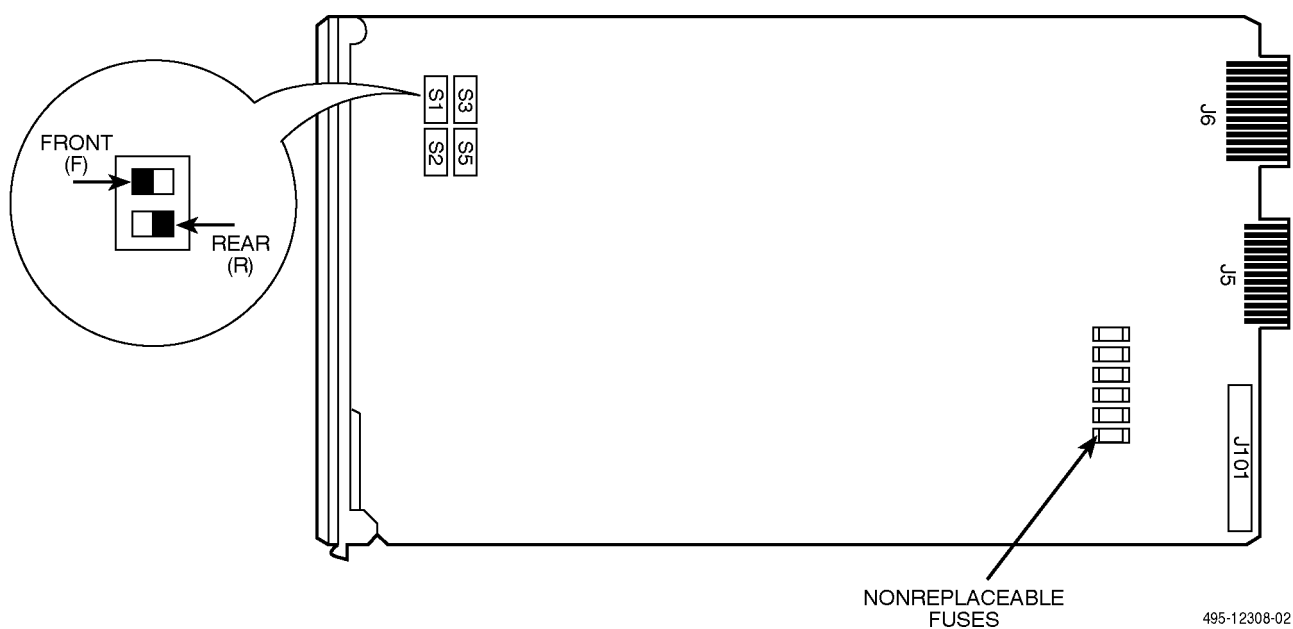
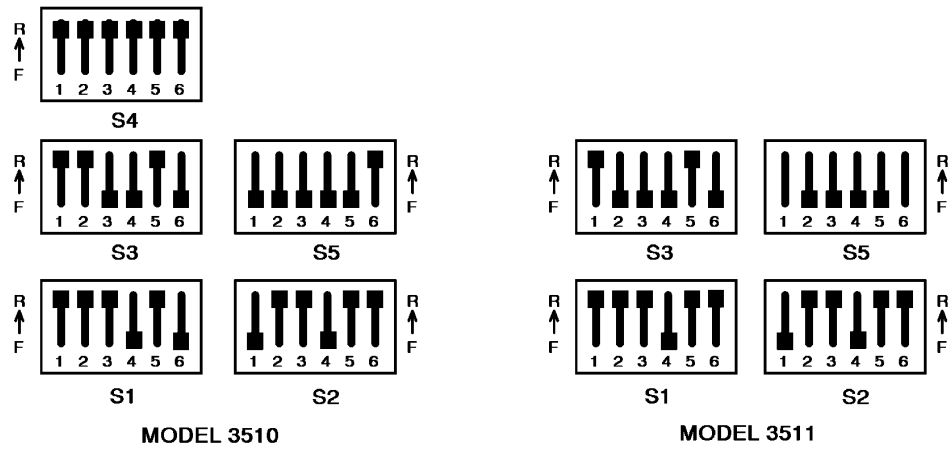
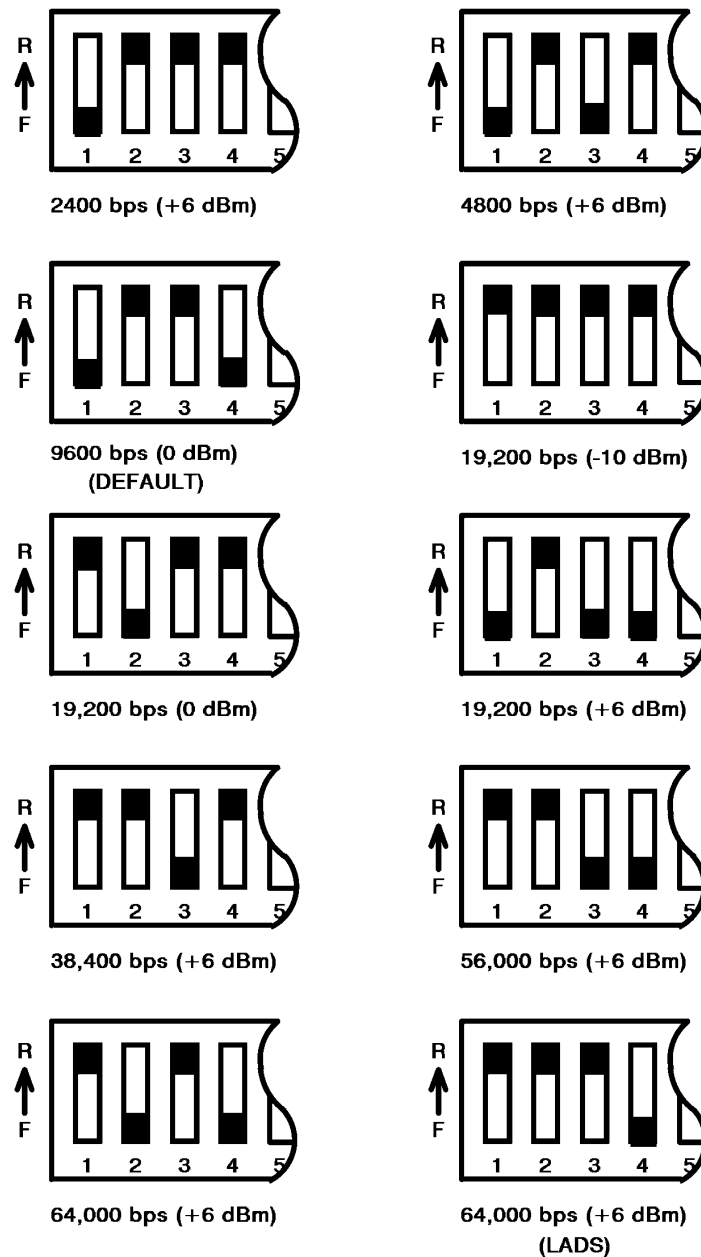


Figure 4-7. Model 3511 DSU Strap and Fuse Locations



493-12273-02

Figure 4-8. DSU Strap Default Settings



491-12267-01

Figure 4-9. Data Rate (Speed) Selection (Switch S2) for Model 3510 and Model 3511 DSUs

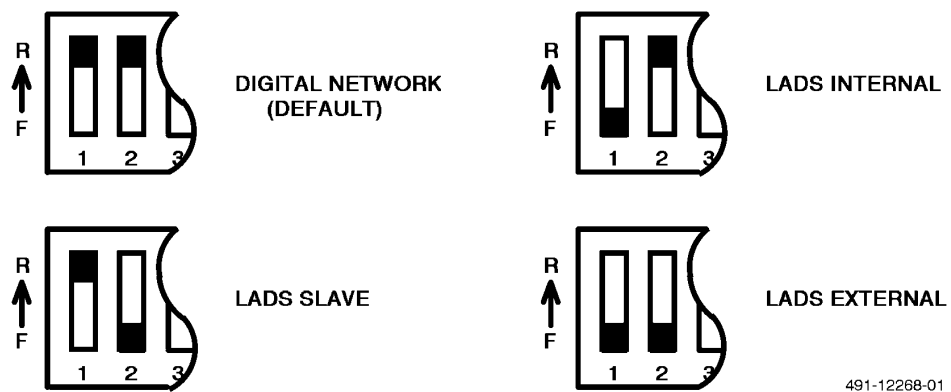


Figure 4-10. Timing Signal Source Selection (Switch S1)

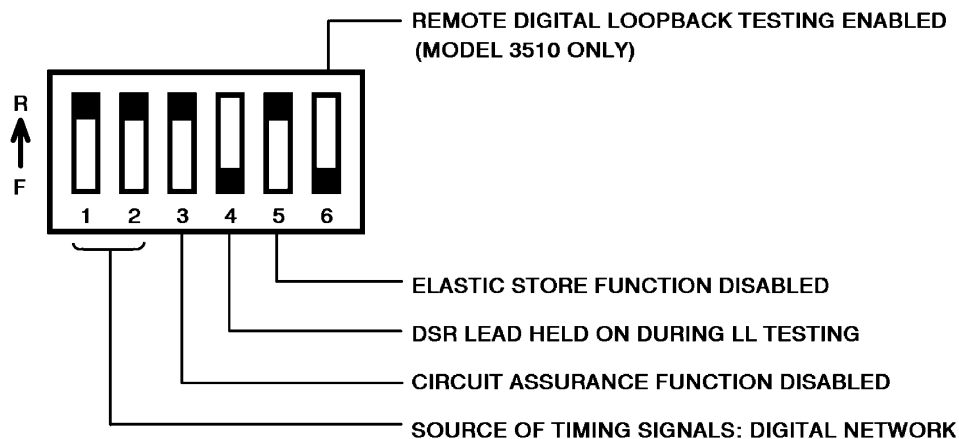
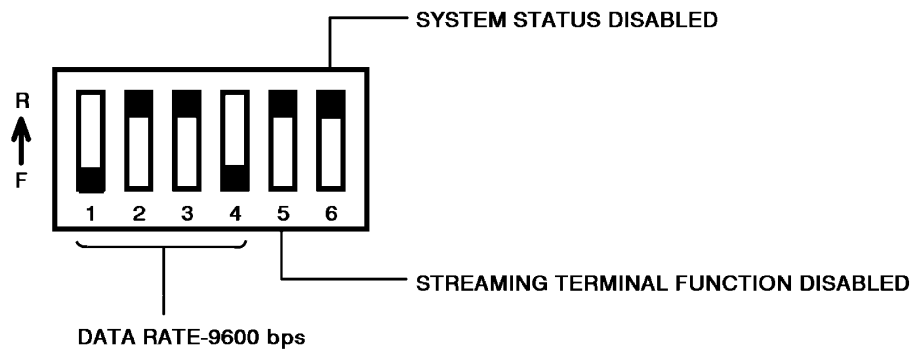
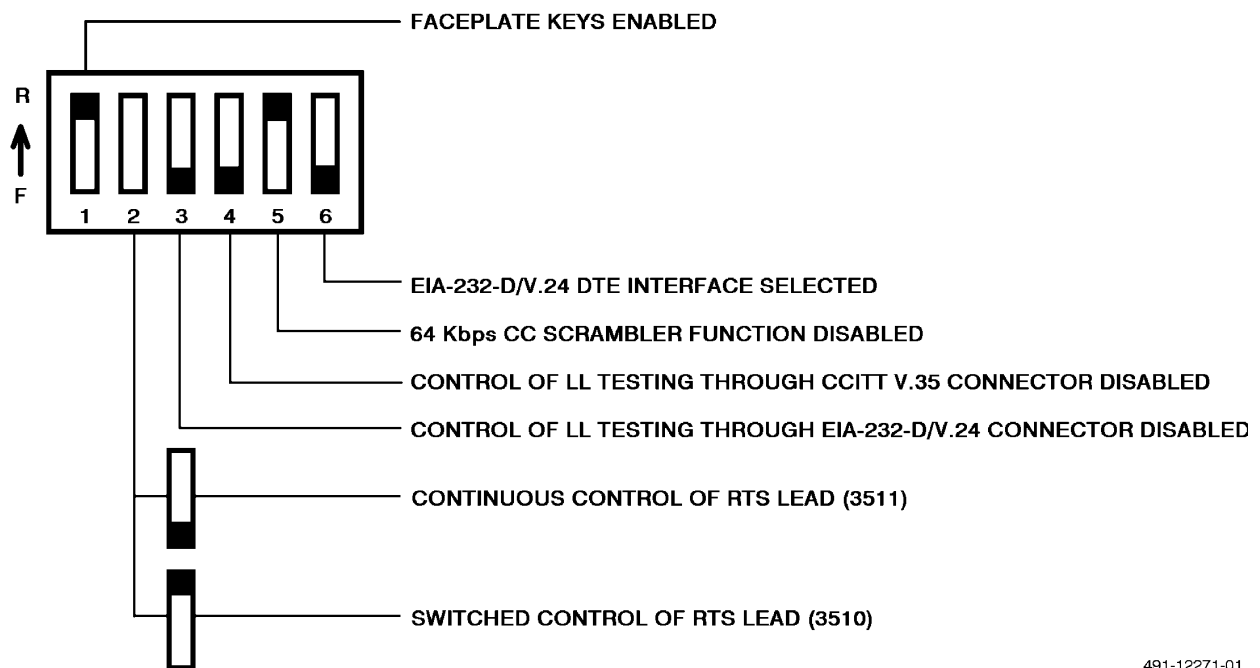


Figure 4-11. S1 Default Settings, Model 3510 and Model 3511 DSUs



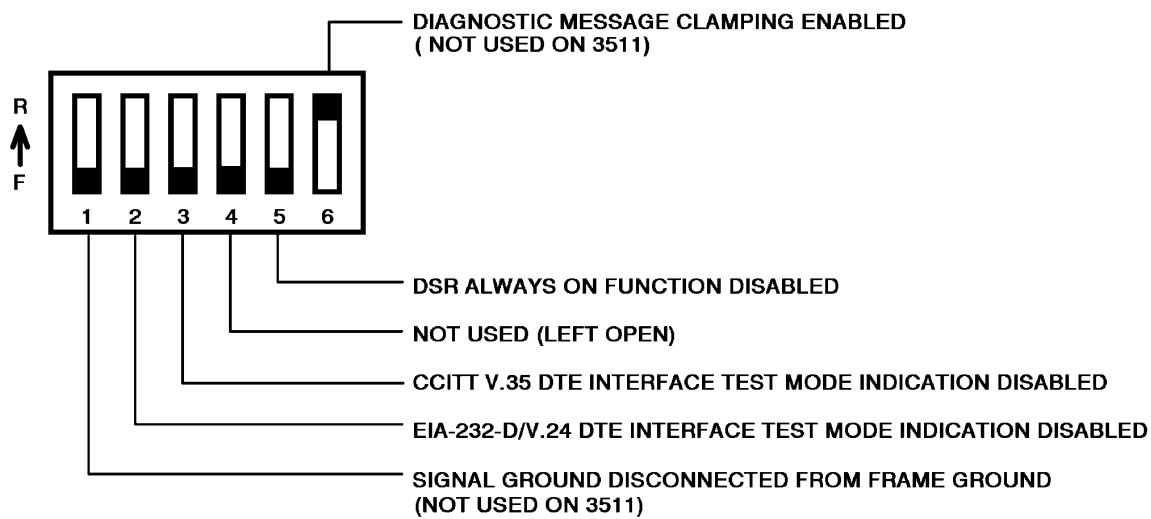
491-12270-01

Figure 4-12. S2 Default Settings, Model 3510 and Model 3511



491-12271-01

Figure 4-13. S3 Default Settings, Model 3510 and Model 3511



491-12272-01

Figure 4-14. S5 Default Settings, Model 3510 and Model 3511

Table 4-3
(1 of 3)
Model 3510 and Model 3511 DSU Straps S1 through S5

Switch Selection	Position	Function ¹
S1-1	—	Selects source of timing signals (see Table 4-4)
S1-2	—	Selects source of timing signals (see Table 4-4)
S1-3	R F	Disables circuit assurance function Enables circuit assurance function
S1-4	R F	Holds DSR lead off during LL testing DSR lead normal during LL testing
S1-5	R F	Disables elastic store function Enables elastic store function
S1-6	R F	Disables remote digital loopback testing Enables remote digital loopback testing
F = Front R = Rear		
¹ Selections are the same for Model 3510 and Model 3511 unless otherwise noted.		

**Table 4-3
(2 of 3)
Model 3510 and Model 3511 DSU Straps S1 through S5**

Switch Selection	Position	Function ¹
S2-1	—	Select data rate (see Table 4-5)
S2-2	—	
S2-3	—	
S2-4	—	
S2-5	R F	Disables streaming terminal function Enables streaming terminal function
S2-6	R F	Disables system status function Enables system status function
S3-1	F R	Disables faceplate switches Enables faceplate switches
S3-2	F R	Enables continuous control of RTS lead Enables switched control of RTS lead
S3-3	F R	Disables control of LL testing through EIA-232-D/V.24 connector Enables control of LL testing through EIA-232-D/V.24 connector
S3-4	F R	Disables control of LL testing through CCITT V.35 connector Enables control of LL testing through CCITT V.35 connector
S3-5	F R	Enables 64,000 bps CC scrambler function Disables 64,000 bps CC scrambler function
S3-6	F R	Selects EIA-232-D/V.24 DTE interface Selects CCITT V.35 DTE interface
S4-1 S4-2 S4-3 S4-5 S4-6		Refer to the Network Address settings, Table 4-6, S4-4 (Model 3510 only)
F = Front R = Rear		
¹ Selections are the same for Model 3510 and Model 3511 unless otherwise noted.		

Table 4-3
(3 of 3)
Model 3510 and Model 3511 DSU Straps S1 through S5

Switch Selection	Position	Function ¹
S5-1	F R	Provides separate signal and frame grounds (Model 3510 only) Connects signal ground to frame ground* (Model 3510 only)
S5-2	F R	Disables test mode indication Enables test mode indication on Pin 25 of EIA-232-D interface
S5-3	F R	Disables test mode indication Enables test mode indication on Pin NN of V.35 interface
S5-4	—	Not used (should be left open)
S5-5	F R	Disables DSR always on function Enables DSR always on function
S5-6	R F	Disables diagnostic message clamping (Model 3510 only) Enables diagnostic message clamping (Model 3510 only)
F = Front R = Rear		
¹ Selections are the same for Model 3510 and Model 3511 unless otherwise noted.		

Table 4-4
Timing Signal Source Selection for Both Model 3510 and Model 3511

S1-1	S1-2	Source
R	R	Digital Network
R	F	Tributary/Slave LADS
F	R	Internal LADS
F	F	External LADS
F = Front R = Rear		

Table 4-5
Data Rate Selection for Both Model 3510 and Model 3511

S2-1	S2-2	S2-3	S2-4	Data Rate (Signal Level)
F	R	R	R	2400 bps (+6 dBm)
F	R	F	R	4800 bps (+6 dBm)
F	R	R	F	9600 bps (0 dBm)
R	R	R	R	19,200 bps (–10 dBm)
R	F	R	R	19,200 bps (0 dBm)
F	R	F	F	19,200 bps (+6 dBm)
R	R	F	R	38,400 bps (+6 dBm)
R	R	F	F	56,000 bps (+6 dBm)
R	F	R	F	64,000 bps CC (+6 dBm)
R	R	R	F	64,000 bps LADS (+6 dBm)
F = Front R = Rear NOTE: Other data rate combinations should not be used.				

Table 4-6
(1 of 4)
Model 3510 DSU S4 Selection

Network Address	Switch S4 Selection					
	1	2	3	4	5	6
1	R	R	R	R	R	F
2	R	R	R	R	F	R
3	R	R	R	R	F	F
4	R	R	R	F	R	R
5	R	R	R	F	R	F
6	R	R	R	F	F	R
7	R	R	R	F	F	F
8	R	R	F	R	R	R
9	R	R	F	R	R	F
10	R	R	F	R	F	R
F = Front R = Rear						

Table 4-6
(2 of 4)
Model 3510 DSU S4 Selection

Network Address	Switch S4 Selection					
	1	2	3	4	5	6
11	R	R	F	R	F	F
12	R	R	F	F	R	R
13	R	R	F	F	R	F
14	R	R	F	F	F	R
15	R	R	F	F	F	F
16	R	F	R	R	R	R
17	R	F	R	R	R	F
18	R	F	R	R	F	R
19	R	F	R	R	F	F
20	R	F	R	F	R	R
21	R	F	R	F	R	F
22	R	F	R	F	F	R
23	R	F	R	F	F	F
24	R	F	F	R	R	R
25	R	F	F	R	R	F
26	R	F	F	R	F	R
27	R	F	F	R	F	F
28	R	F	F	F	R	R
29	R	F	F	F	R	F
30	R	F	F	F	F	R
31	R	F	F	F	F	F
32	F	R	R	R	R	R
33	F	R	R	R	R	F
34	F	R	R	R	F	R
35	F	R	R	R	F	F
F = Front R = Rear						

Table 4-6
(3 of 4)
Model 3510 DSU S4 Selection

Network Address	Switch S4 Selection					
	1	2	3	4	5	6
36	F	R	R	F	R	R
37	F	R	R	F	R	F
38	F	R	R	F	F	R
39	F	R	R	F	F	F
40	F	R	F	R	R	R
41	F	R	F	R	R	F
42	F	R	F	R	F	R
43	F	R	F	R	F	F
44	F	R	F	F	R	R
45	F	R	F	F	R	F
46	F	R	F	F	F	R
47	F	R	F	F	F	F
48	F	F	R	R	R	R
49	F	F	R	R	R	F
50	F	F	R	R	F	R
51	F	F	R	F	R	R
52	F	F	R	F	R	R
53	F	F	R	F	R	F
54	F	F	R	F	F	R
55	F	F	R	F	F	F
56	F	F	F	R	R	R
57	F	F	F	R	R	F
58	F	F	F	R	F	R
59	F	F	F	R	F	F
60	F	F	F	F	R	R
F = Front R = Rear						

Table 4-6
(4 of 4)
Model 3510 DSU S4 Selection

Network Address	Switch S4 Selection					
	1	2	3	4	5	6
61	F	F	F	F	R	F
62	F	F	F	F	F	R
63	F	F	F	F	F	R
64 ¹	R	R	R	R	R	R
F = Front R = Rear						
¹ FACTORY DEFAULT SETTING (Broadcast Address)						

DSU Strap Setting Descriptions

The following information provides DSU strap setting descriptions.

S1-1 and S1-2: Timing – The DSU comes from the factory with digital data system (DDS) timing selected. DDS timing is required when the DSU is connected to the DDS network. Three other types of timing (receive, internal and external) are available for LADS use.

S1-3: Circuit Assurance – When enabled, the DSU does not turn on the DTE Clear-to-Send (CTS) interface lead unless the CTS timing delay has expired and the DSU receiver is getting a data signal from the network (received line signal detector lead is on).

When disabled, the CTS interface lead turns on in response to the Request-to-Send lead if there is a valid data or control signal from the network.

NOTE

If the DTE Request-to-Send (RTS) interface lead is ON, and the DSU is not receiving a data signal from the network, the DSU sends a continuous MARK signal to the network.

S1-4: DSR Normal during Local Loopback – DSR ON during Local Loopback. When enabled, this strap forces the DSR lead ON during a Local Loopback. This allows DTEs that rely on DSR being on to send test messages to the DSU.

When disabled, DSR is turned Off during a Local Loopback.

S1-5: Elastic Store – When enabled, the DSU compensates for small (3 bits) timing phase drifts that may occur when the DTE interface of the DSU is connected to the DTE interface of an analog modem to provide an extended network. If you do not have an extended network, place the strap in the disable position.

S1-6: Remote Digital Loopback Enable – When enabled, the DSU responds to a front panel-initiated Remote Loopback request from a remote DSU. When disabled, the DSU ignores the Remote Loopback request.

NOTE

For nondiagnostic data over a multipoint network, set this strap on only one tributary DSU.

S2-1–S2-4: Data Rate – The DSU has ten data rate selections. Refer to Table 4-5.

S2-5: Streaming – This strap is provided at a tributary DSU to detect when the terminal is streaming (that is, the RTS circuit from the DTE remains on longer than the streaming terminal timer). This selection is only effective when the DSU is strapped for switched RTS operation. Streaming detection will not be performed if the DSU is in a test condition.

The DSU activates the streaming timer whenever the customer Request-to-Send (RTS) circuit turns ON, and it declares the streaming condition if the circuit is still ON at the end of the timer interval. If the circuit is turned Off before the end of the interval, the timer is reset. The timeout is fixed at 27 seconds for subrate speeds of 19.2 and below, and at 3 seconds for 38.4, 56, and 64 kbps.

S2-6: System Status – When enabled, the DSU turns off the DTE Data-Set-Ready (DSR) interface lead when the network sends the Out-of-Service or Out-of-Frame message, or no signal is received from the network. When disabled, a network alarm has no affect on DSR.

S3-1: Faceplate Disable – This strap controls the LL, TP, DL, and RL test switches on the DSU's front panel. When Switch S3-1 is open, the front panel switches are disabled and the DSU will not respond to any faceplate test requests. When S3-1 is closed, the faceplate switches are enabled. Depending on how this strap is set, the DSU will or will not respond when these switches are pressed. This selection is designed to prevent accidental disruption of data transfer.

S3-2: Continuous/Switched Request-to-Send – When enabled (continuous), the DSU holds its internal RTS circuit ON independent of the DTE RTS interface lead. When disabled (switched), the DSU internal RTS circuit follows the DTE RTS interface lead.

S3-3: Local Loopback (LL) through EIA-232-D Connector – When enabled, this strap permits the use of Pin 18 of the EIA-232-D interface to initiate a Local Loopback.

S3-4: Local Loopback (LL) through CCITT V.35 Connector – When enabled, this strap permits the use of Pin LL of the V.35 interface to initiate a Local Loopback.

S3-5: Scrambler – This strap enables the data scrambler to be used with 64 kbps Clear Channel operation. Select this strap to reduce the probability of customer data accidentally generating network control codes. The DSUs at each end must be 3500 Series DSUs, and both must be strapped the same (scrambling or no scrambling). Unless all DSUs on a circuit are 3500s, scrambling should be disabled.

S3-6: EIA-232-D/V.24 DTE Interface/CCITT V.35 DTE Interface – This strap selects either the EIA-232-D port or the V.35 DTE port as the active interface.

S4-1 – S4-6: Network Address – Network Addresses are only required for 3510 tributary DSUs installed in DATAPHONE II 2600 diagnostic networks. Network addresses must be unique on the multipoint network. Obtain the network address from the installation order or contact the network management center.

S5-1: Signal Ground – Frame Ground – This strap connects Signal Ground to Frame Ground, or separates Signal Ground from Frame Ground. (This strap only applies to Model 3510 DSUs. For the Model 3511 DSUs, the strap is on the UAC.)

S5-2: Test Mode Indication – When this strap is enabled, Pin 25 in the EIA-232-D interface of the DSU is ON to indicate when the DSU is in a test condition; it is Off when the DSU is operating normally. When this strap is disabled, Pin 25 is opened toward the DTE.

S5-3: Test Mode Indication – This strap forces the use of Pin NN of V.35 interface of the DSU to indicate when the DSU is in a test condition. When this strap is disabled, Pin NN is opened toward the DTE.

S5-4: Not used. Should be left open.

S5-5: DSR Always ON – When enabled, this strap overrides any other DSR-related straps and ensures that DSR is always ON as long as the DSU has power and is functioning. When disabled, DSR is an active interface lead.

S5-6: Diagnostic Message Clamping – If this strap is enabled, the tributary DSU will clamp received data to MARK and received line signal detect to Off whenever 2600 or 3500 Series diagnostic test/command messages are received. These messages are detected at a tributary DSU by the presence of Control Mode Idle signals. The clamping prevents diagnostic messages from reaching the customer DTE interface. If the control DSU must be strapped for Switched Carrier, then this strap must be disabled at the tributary DSU. The tributary DSU will pass diagnostic messages to its RXD lead except when the DSU is involved in a test or has been disabled.

NOTE

This strap is only required for Model 3510 tributary DSUs installed in DATAPHONE II 2600 diagnostic networks. For all other applications, Diagnostic Message Clamping should be disabled.

Alarm Output Installation

The carrier alarm relay installed in the COMSPHERE 3000 Series Carrier activates when there is a carrier failure or a network failure of the associated digital circuit. When operated with your visual or audio equipment, an alarm can be given locally in the equipment room.

The Model 3511 DSU triggers the alarm when any of the following conditions occur:

- No Signal
- Out-of-Service
- Streaming Terminal

The relay is capable of switching up to 30 watts (resistive load), with a maximum voltage of 60 Vdc, and a maximum current of 1 amp for “switching” and 2 amps for the “steady state.”

Refer to the *COMSPHERE 3000 Series Carrier, Installation Manual* for the alarm output connection installation procedure.

Connector Pins A

Digital Network Connectors	A-1
EIA-232-D/V.24 Connector	A-3
V.35 Connector	A-3

Digital Network Connectors

A keyed, 8-pin modular type RJ48S jack on the rear of the Model 3510 connects the DSU to the digital network. Figure A-1 shows the RJ48S plug. Pin assignments are listed and described in Table A-1.

A USOC RJ48T 50-pin network interface connector on the COMSPHERE 3000 Series Carrier supports the digital network connections for 8 DSUs. The pin assignments for this interface are listed in Table A-2.

Canadian purchasers of Model 3510 DSUs receive a cable that adapts the 8-pin USOC RJ48S connector on the rear of the DSU to the 6-pin Dataroute® standard. The pin assignments for this interface are listed in Table A-3. For Model 3511 DSUs in a COMSPHERE 3000 Series Carrier, an adapter cable is available (refer to the *COMSPHERE 3000 Series Carrier, Installation Manual* for details).

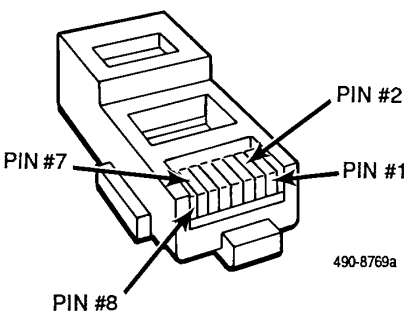


Figure A-1. 8-Pin RJ48S

Table A-1
RJ48S Digital Network Connector Pins for the Model 3510 DSU

Pin	Identifier	Function
1	R1	Transmit data to local loop
2	T1	Transmit data to local loop
3	—	—
4	—	—
5	—	—
6	—	—
7	T	Receive data from local loop
8	R	Receive data from local loop

Table A-2
RJ48T Digital Network Connector Pins (50-Pin) for the
COMSPHERE 3000 Series Carrier (Model 3511)

Slot	Pin			
	Receive Circuits		Transmit Circuits	
	T	R	T1	R1
1 or 9	26	1	27	2
2 or 10	28	3	29	4
3 or 11	30	5	31	6
4 or 12	32	7	33	8
5 or 13	34	9	35	10
6 or 14	36	11	37	12
7 or 15	38	13	39	14
8 or 16	40	15	41	16

Table A-3
Standalone (Model 3510) Canadian Adapter Cable Pins

RJ48S		RJ11	
Pin	Circuit Name	Pin	Circuit Name
1	R1	—	—
2	T1	1	Not used
3	Not used	2	T
4	Not used	3	R1
5	Not used	4	T1
6	Not used	5	R
7	T	6	Not used
8	R	—	—

EIA-232-D/V.24 Connector

The Model 3510 DSU's rear panel and the Model 3511 DSU's rear connector plate includes a 25-pin EIA-232-D/V.24 connector for connection to the DTE. Pin assignments are listed and described in Table A-4.

V.35 Connector

The Model 3510 DSU's rear panel includes a standard 34-Pin V.35 connector. Table A-5 identifies the 34-pin V.35 interface pin assignments.

The Model 3511 DSU is shipped with a rear connector plate, which is mounted onto the rear of the 3000 Series Carrier. The plate contains two 25-pin DTE connectors, a 25-pin EIA-232-D/V.24 connector and a 25-pin CCITT V.35 connector. A V.35 interconnect cable, an interface between the 25-pin CCITT V.35 connector and a standard 34-pin V.35 connector, is shipped with the rear connector plate. Figure A-2 shows the rear connector plate and Figure A-3 shows the V.35 interconnect cable. Table A-6 identifies the interconnect cable's pin assignments.

Table A-4
Model 3510 and 3511 DSU 25-Pin EIA-232-D/V.24 Connector Pins

Pins	EIA-232-D Identifier	CCITT Identifier	Function
2	BA	103	Transmitted Data (TXD)
3	BB	104	Received Data (RXD)
4	CA	105	Request-to-Send (RTS)
5	CB	106	Clear-to-Send (CTS)
6	CC	107	Data Set Ready (DSR)
7	AB	102	Signal Ground
8	CF	109	Line Signal Detect (LSD)
9	—	—	Positive Test Voltage
10	—	—	Negative Test Voltage
15	DB	114	Transmitter Signal Element Timing – DCE Source
17	DD	115	Receiver Signal Element Timing – DCE Source
18	LL	141	Local Loopback
24	DA	113	Transmitter Signal Element Timing – DTE Source
25	TM	142	Test Mode

Table A-5
Model 3510 DSU 34-Pin V.35 Connector Pins

Pins	V.35 Identifier	CCITT Identifier	Function
B	AB	102	Signal Ground
P, S	BA	103 a, b	Transmitted Data (TXD)
R, T	BB	104 a, b	Received Data (RXD)
C	CA	105	Request-to-Send (RTS)
D	CB	106	Clear-to-Send (CTS)
E	CC	107	Data Set Ready (DSR)
F	CF	109	Line Signal Detect (LSD)
HH	—	—	Positive Test Voltage
KK	—	—	Negative Test Voltage
U, W	DA	113 a, b	Transmitter Signal Element Timing – DTE Source
Y, AA	DB	114 a, b	Transmitter Signal Element Timing – DCE Source
V, X	DD	115 a, b	Receiver Signal Element Timing – DCE Source
L	LL	141	Local Loopback
NN	TM	142	Test Mode

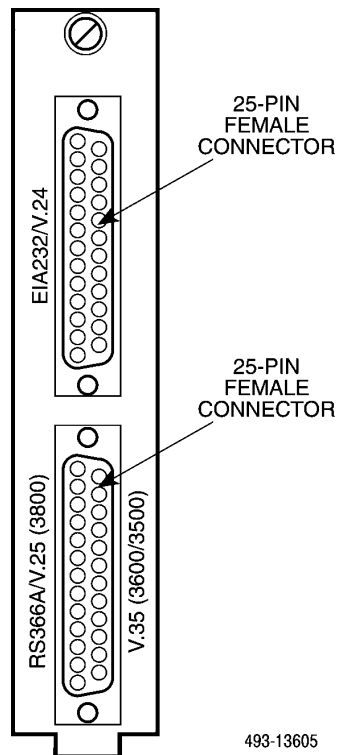


Figure A-2. Model 3511 DSU Rear Connector Plate

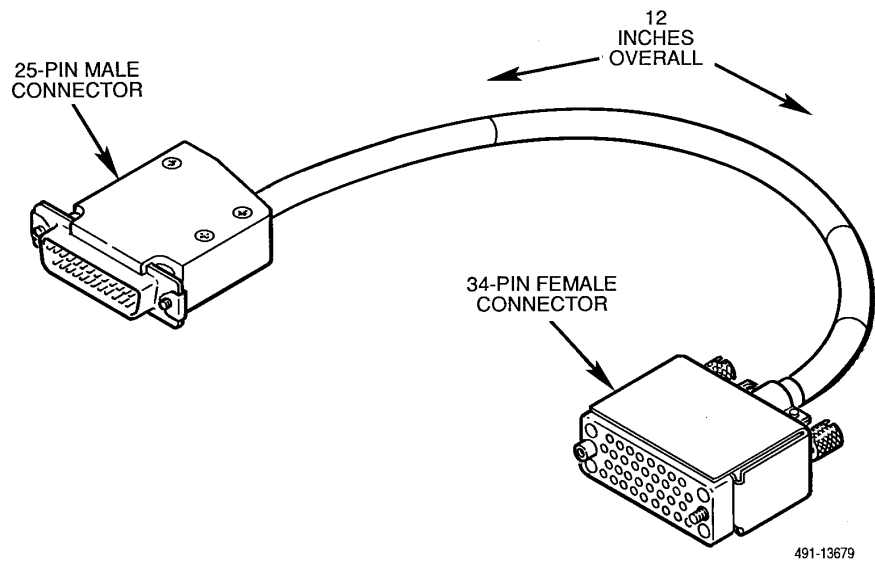


Figure A-3. V.35 Interconnect Cable (Feature Number 3000-F1-510)

Table A-6
Model 3511 DSU 25-Pin CCITT V.35 Connector Pins

25-Pin Connector on Rear Connector Plate	34-Pin Connector on V.35 Interconnect Cable	Circuit Name
7	B	Signal Ground
4	C	Request-to-Send (RTS)
5	D	Clear-to-Send (CTS)
6	E	Data Set Ready (DSR)
8	F	Received Line Signal Detect (RLSD)
18	L	Local Loopback (LL)
24, 11	P, S	Transmitted Data (TXD)
23, 22	R, T	Received Data (RXD)
15, 2	U, W	Transmitter Signal Element Timing – DTE Source
16, 3	V, X	Receiver Signal Element Timing – DCE Source
14, 1	Y, AA	Transmitter Signal Element Timing – DCE Source
9	HH	Positive dc Test Voltage
10	KK	Negative dc Test Voltage
25	NN	Test Mode (TM) Shell Shield

Timing During Testing B

In some test modes, the timing source for the DSU changes when the DSU is configured for a timing source other than DDS. The following charts (Figure B-1) show the DSU's timing for each step of the following tests:

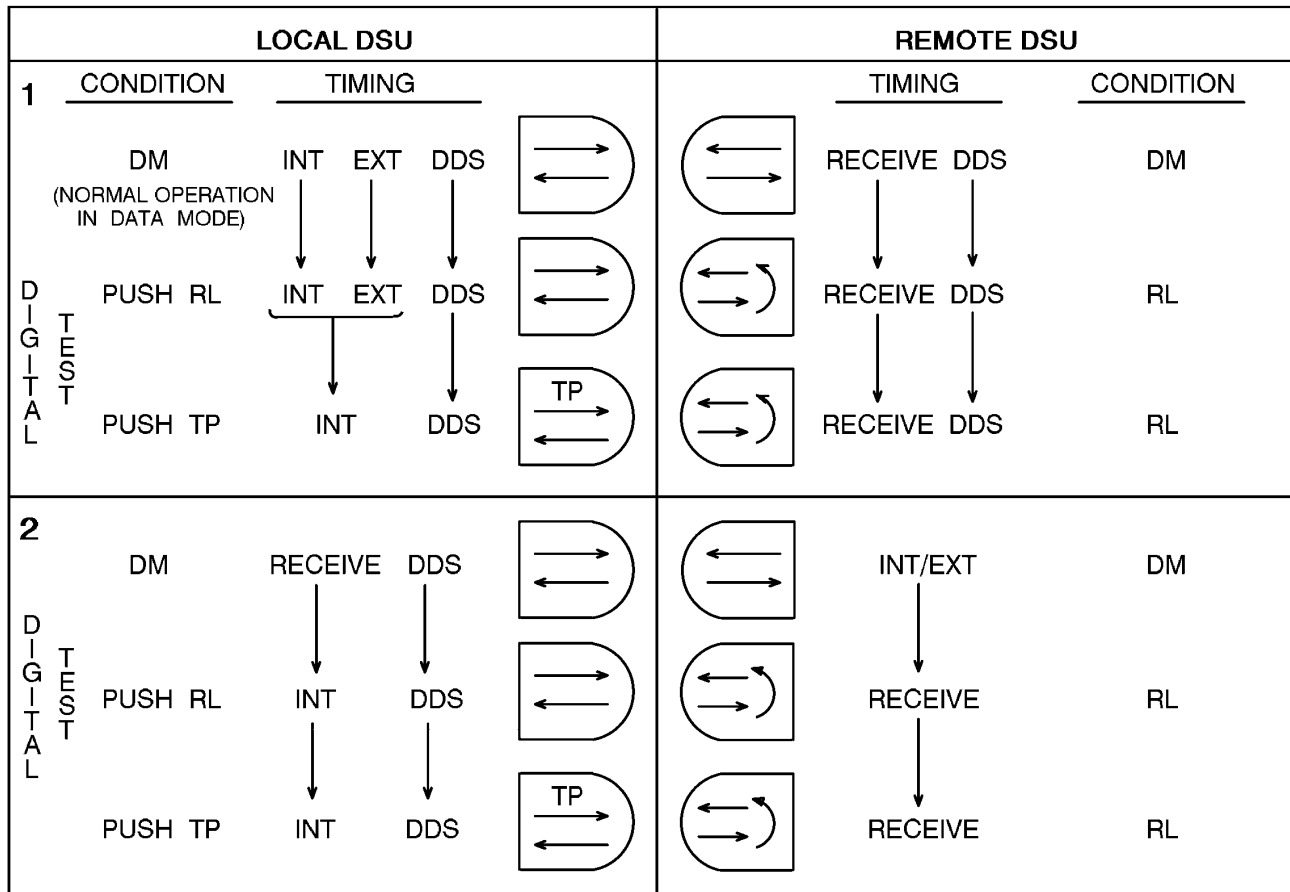
- Digital Test – Charts 1 or 2
- Device Test – Chart 3
- Digital Loopback – Chart 4
- Test Pattern – Chart 5

The chart number is located in the upper left-hand corner of each segment of Figure B-1, above the name of the test.

For each test, find the appropriate timing column down through the steps in the test to determine the source of timing changes.

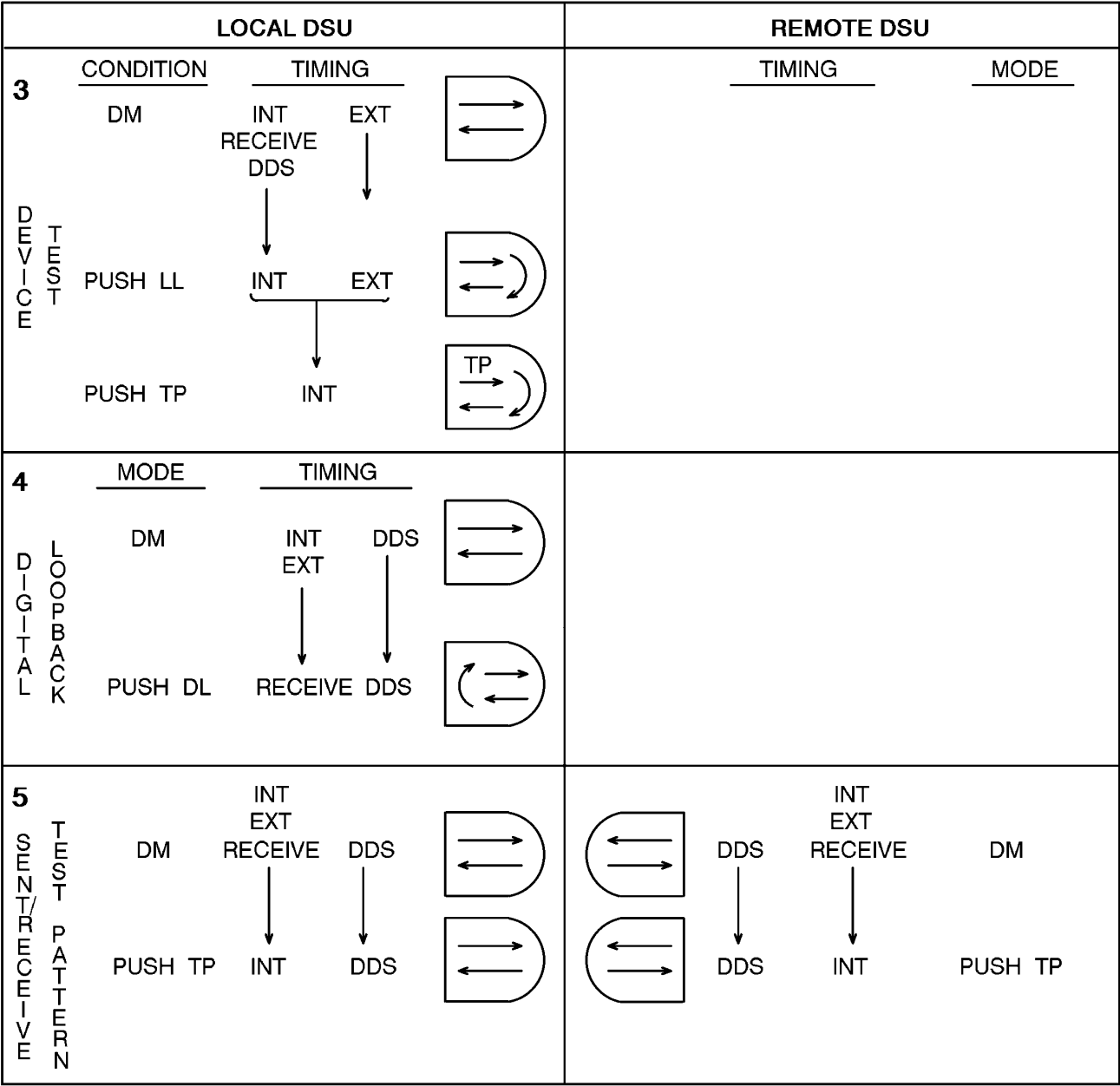
NOTE

For Digital Test, the configuration for both local and remote DSUs must be considered.



491-12044-02

Figure B-1. DSU Timing Chart (1 of 2)



491-12045-01

Figure B-1. DSU Timing Chart (2 of 2)

Equipment List C

Equipment	Feature Number	COMCODE
Model 3510 DSU in housing	3510-A1-001	106238546
Model 3511 DSU circuit card (includes Rear Connector Plate)	3511-B1-002	106476245
Rear Connector Plate – 25-Pin EIA-232/25-Pin CCITT V.35	3000-F1-021	106476229
V.35 Interconnect Cable	1' — 3000-F1-510	106476237
Modular 8-pin to 8-pin (RJ45S) Network Cable	14' — 3600-F3-501 25' — 3600-F3-502	107331381 107331365
Modular 8-pin to 6-pin Network Cable (for the Model 3510 in Canada)	3000-F1-006	106239155
<i>COMSPHERE 3000 Series Carrier, Installation Manual</i>	3000-M3-001	—

The following is for Field Service personnel.

Equipment	Part Number
Standalone (Model 3510 DSU) CCA	870-1576-8xxx
Carrier-mounted (Model 3511 DSU) – modular CCA	870-1631-8xxx
Rear Connector Plate – 25-Pin EIA-232/25-Pin CCITT V.35	315-0023-0131
AC Power Cord (included with Model 3510)	125-0007-0031
V.35 Interconnect Cable	035-0135-0031
Modular 8-pin to 8-pin (RJ45S) Network Cable	14' — 035-0116-1431 25' — 035-0116-2531
Modular 8-pin to 6-pin Network Cable (for the Model 3510 in Canada)	125-0089-0731
LCD (16 characters by 2 lines) with Cable	153-0009-1131
Membrane Switch	631-0014-0031
<i>COMSPHERE 3000 Series Carrier, Installation Manual</i>	3000-A2-GA31

Glossary

carrier	A 19- or 23-inch rack that supports single and multiport configurations and accommodates up to 16 DSUs.
Clear-to-Send (CTS)	A signal issued by a DSU to indicate that it is connected to the digital network and is ready to accept data.
Consultive Committee for International Telegraphy and Telephony (CCITT)	The international telecommunications standards organization.
control	A data service unit (DSU) that is generally collocated with the host computer.
Data Communication Equipment (DCE)	Equipment used for data transmission and reception.
Data Service Unit (DSU)	A piece of equipment used to connect various types of data terminal equipment (DTEs) to a digital network.
Data Set Ready (DSR)	A signal issued by the DSU to indicate that it is powered on and ready to transmit data.
Data Terminal Equipment (DTE)	Terminal equipment connected to the DSU that is used for communication over digital networks. May be a terminal, computer, printer, or multiplexer.
Data Terminal Ready (DTR)	An EIA-232-D signal which indicates that the DTE is ready for operation.
DATAPHONE II DSU	An earlier generation data service unit (DSU).
DATAPHONE Digital Service (DDS)	An AT&T digital network used for communication among various types of DTEs.
Digital Data Service (DDS)	A digital network.
Digital Loopback (DL)	A type of diagnostic test in which data is looped from the network through a DSU back to the digital network.
Electronic Industries Association (EIA)	An organization which sets data communication industry standards.

Line Signal Detect (LSD)	A signal issued by the DSU that indicates that it is connected to a functional digital network.
Local Area Data Set (LADS)	A mode of operation where the control and tributary DSUs are directly connected via 4-wire, non-loaded metallic pairs rather than via a digital (DDS) network; they do not pass data through a DDS network.
Local Loopback (LL)	A type of diagnostic test in which data is looped through a DSU from the DTE interface and back to the DTE.
modular DSU	A carrier-mounted circuit card that contains “gold finger” contacts that plug into a rear connector plate. This circuit card type is easily removed from the front of the carrier without having to disconnect cables. The Model 3511 is a modular DSU.
network interface	The digital network vendor’s termination device (modular jack, terminal block, etc).
Network Management System (NMS)	A generic term for an Paradyne network management system. Includes the DATAPHONE II diagnostic console (DC), network controller (NC), system controller (SC), and 6800 Series NMS.
Out-of-Frame (OOF)	A digital network trouble signal that indicates that frame alignment has been lost.
Out-of-Service (OOS)	A digital network trouble signal that indicates the terminal or the access line is out of order.
rear connector plate	A plate with two DTE connectors that is used with a Model 3511 DSU (a modular DSU). The rear connector plate is mounted onto the rear of the carrier. It allows removal of a Model 3511 DSU without first disconnecting the DTE cables at the rear of the carrier.
Received Data (RXD)	A serial stream of digital information that is received by the DTE.
Regional Bell Operating Company (RBOC)	A Bell Operating Company in a particular geographic area.
remote (REM)	Refers to a data service unit (DSU) that is at the other (far) end of a DDS network.
Remote Digital Loopback (RL)	A digital loopback of a remote DSU initiated at the local DSU.
Request-to-Send (RTS)	A signal generated by a data terminal equipment (DTE) to indicate that it has data ready to transmit.
streaming terminal condition (STR)	A condition that occurs when a multipoint network tributary DTE holds the RTS lead on too long.
Test Pattern (TP)	A test that generates a digital test pattern and verifies that the DSU is receiving the same pattern.
Transmitted Data (TXD)	A serial stream of digital information that is transmitted by a DTE.
Universal Service Ordering Codes (USOC)	Generic telephone company service ordering codes.

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